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WILDLIFE IN NORTH CAROLINA

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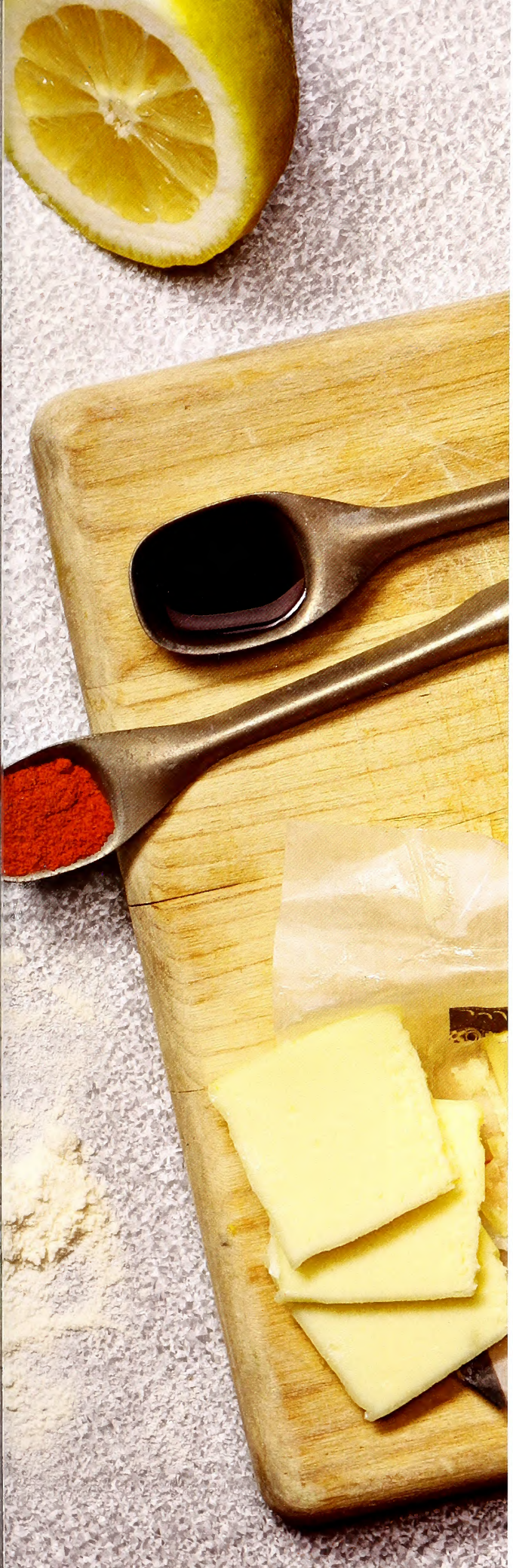
Take a few simple ingredients, some fresh seafood from the North Carolina coast and you have the recipe for a flavorful one-pot dish.
PHOTOGRAPH BY MELISSA McGAW/NCWRC.



Volume 77 | Number 6

WILDLIFE IN NORTH CAROLINA

contents | november • december 2013

FEATURES

4 NOT A FLASH IN THE PAN
written by Mike Zlotnicki | photographed by Melissa McGaw
Gunsmith Dan Hopping loves to craft flintlocks and shoot them.

10 THE ISSUE OF MERCURY AND FISH
written by Kent L. Nelson
We've seen the public health warnings, but how does mercury contaminate fish and what can be done about it?

16 A DIFFERENT LOOK AT FIRST LIGHT
written by Ian Privette | illustrated by Gary Palmer
Hunting the Carolina duck from a kayak.

20 TO GLOVE OR NOT TO GLOVE
written by Megan Kirchgessner DVM, Ph.D.
Most hunters know that they should, but fewer do when cleaning animals.

24 ONE-POT SEAFOOD DISHES
written by Keith Hobbs | photographed by Melissa McGaw
Simple and delicious, clam, crab, shrimp and oyster dishes fill the bill for either a few people or a crowd.

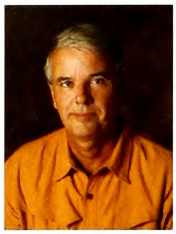
30 BUMPING THE BOTTOM FOR WINTER TAILRACE TROUT
written by Jeremy Grady | photographed by Melissa McGaw
Effective techniques for fooling tailrace trout during the cold months.

DEPARTMENTS

2 EDITOR'S NOTE
3 LETTERS
36 WILD NOTEBOOK
40 BACK PORCH
43 NATURE'S WAYS
44 OUR NATURAL HERITAGE
45 OUTDOOR MOMENT

Cover: Wood ducks can be found on many small bodies of water throughout our state, providing opportunities for hunting in the fall and winter or wildlife viewing at other times of the year. PHOTOGRAPH BY GARY BURKE.

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission. It is dedicated to the sound conservation of North Carolina's wildlife and other interrelated natural resources and also to the environment we share with them.



EDITOR'S NOTE

It does a fellow good to have a place where he can go and escape life, a place of refuge where he can consider and reflect. Something akin to Robert Frost's birch trees, but without the climbing, or William Butler Yeats' isle at Lake Innisfree, minus the building and planting.

ILLUSTRATION BY JOE MAHLER

Ideally this place shouldn't be too far from where a man lives, else the journey would get in the way. It is of untold benefit, too, if he can fish while thinking. Sliding into the rhythm of fly casting lets his brain relax and rid itself of daily bothers that left alone, all too soon would disappear unnoticed and unlamented into the empty places in his mind.

Above all, it should be a place of good memories which will serve as a tonic to temper whatever unpleasantness might have pushed him to his sanctuary.

Of course, this is not a place to visit too often, just when need arises and presses a fellow into escaping an accumulation of exasperations. Sometimes it is a place to go in despair, where he that the spirit of the place—"a stone, a leaf, an unfounded door"—will set things right. As Frost wrote:

"It's when I'm weary of considerations,
And life is too much like a pathless wood
Where your face burns and tickles with the cobwebs
Broken across it, and one eye is weeping
From a twig's have lashed across it open."

My place is not too far away, although it is a bit farther than it used to be. I didn't come across it on my own; my daughter, Betsy, took me there one Sunday afternoon and we fished and caught for several hours, laughing and talking as the world slid away on that little river and around the bend and out of sight. We weren't even aware that our cares had disappeared, but relished their absence all the same.

I've always cherished the fact that she introduced me to a place I came to love. I think of it as "Betsy's Place" and always will. In my mind, I can visit that day and that place any time I choose, watching as she proudly holds the lone bass we caught that day. It is a place of happiness and solitude and fish and the living sound of water. How easy it would be to remain there, never to return.

Jim Wilson

Wildlife in North Carolina (ISSN 0043-549X) is published eight times a year by the N.C. Wildlife Resources Commission, 1751 Varsity Drive, Raleigh, N.C. 27606. Periodicals postage paid at Raleigh, N.C. and additional mailing offices. Subscription rates: one year $12, three years $30. All foreign subscriptions are $28 per year. Payable by U.S. Postal Service money order or U.S. bank cashier's check. All orders must be prepaid. Please allow 6 to 8 weeks delivery on new subscriptions and address changes. POSTMASTER: Send address changes to Circulation Manager, 1710 Mail Service Center, Raleigh, N.C. 27699-1710. Address all correspondence regarding subscriptions to Circulation Manager. For subscription help, dial 1-866-945-3746. Articles in *Wildlife in North Carolina* may represent the personal views of authors, and do not imply endorsement by the N.C. Wildlife Resources Commission. *Wildlife in North Carolina* is available on audio cassette through the Department of Cultural Resources, Library for the Blind and Physically Handicapped, Raleigh, N.C., 919-733-4376. The N.C. Wildlife Resources Commission is an equal opportunity agency. Copyright ©2013 by the N.C. Wildlife Resources Commission. No portion of this magazine may be reproduced by any means without the written consent of *Wildlife in North Carolina*.

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NOVEMBER • DECEMBER 2013 VOLUME 77, NUMBER 6

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Those Dogs Can Hunt

"Dogs That Can Do It All" in the September/October issue is an outstanding piece of work on versatile hunt dogs, their owners/handlers and the Carolinas Chapter of NAVHDA. The article clearly establishes how varied dogs and owners can be. The different breeds in the Carolinas Chapter are nicely featured. I wonder how many people have heard of a Bracco Italiano or a Pudelpointer. I hadn't until I became a member.

I was pleased to see the article explains the NAVHDA testing system. Your readers can appreciate the commitment an owner must make to train his dog to execute the different tasks. The progressive degree of difficulty with each test was evident thanks to the author. There is no greater joy than to see a fellow chapter member handle their dog during testing. Chapter members take pride when one of their own pass and moves to the next level.

Thank you for doing this story.

Vivian Wiese-Hansen
Raleigh

Great Article, Familiar Problems

My compliments to fisheries biologist David Goodfred for his well-written and informative article "What Can Brown Do for You" (*Wildlife in North Carolina*, September/October 2013). It exemplifies the fine work the staff of the Division of Inland Fisheries is doing in the face of environmental pressures and limited funds. Unfortunately, most of the aquatic habitat problems mentioned are the same or worse than we dealt with when I was in the Fish Division from 1950 to 1960.

Duane Raver
Garner

Antique Fishing

For the past many years, the last page of *Wildlife in North Carolina*, the Jim Dean page, has been for me the highlight of each issue. And then in recent issues (May/June and July/August) his wonderful history of old bass lures — ones I think he grew up with. I personally know of his interest in bassing, and I'm taking this opportunity to invite him to a great day of it with John Murchison and me. Jim might not be fishing with those antique lures he wrote about, but he would surely be in the company of antique fishermen — ages 84 and 85.

George Clark
Wilmington

The Logs Mystery

I read with interest the article in the March/April issue, "Out of the Depths," written by Lawrence S. Earley.

It posed the mystery of the source of the logs found in groups at the bottom of the river. How could logs in a group go to the bottom? The article pointed out that it is easier to explain how individual logs might end up there than how those in a group might end up there.

I think some recent travels in Canada and Oregon may pose the answer. While on the train headed east into Vancouver, we rode along the Frazier River and the Willamette River. The guide pointed out huge rafts of logs in the river. The dimensions of these rafts might have been a mile by one-half mile. The various logging companies were allotted areas of the river in which to store their logs. It occurred to me that if a group of these logs sank while no one was watching, that might explain why 100 years later someone would find a group of logs at the bottom of a river or lake.

A few days later we were traveling through Oregon. I forget the river involved. However, looking at one of the bays in this river, we saw another storage area of logs. Therefore, it appears that logs can be stored in very large quantities in a lake or river. Perhaps they sank. Also, a group of logs could actually move after they have sunk.

So maybe the logs in the groups mentioned in the article may have been the result of logs which were stored, forgotten about, or the owners of them went bankrupt or whatever, and they eventually sank. Or perhaps they simply sank from long neglect. Who knows?

It is an interesting theory in which I thought you might be interested.

W.H. Odell
East Bend

Alpha-Gal Diagnosis

"Thank you, thank you, thank you for printing the letter from Wes Muchenfuss in the September/October issue of *Wildlife in North Carolina*. His letter was in reference to you not mentioning Alpha-Gal, an allergy to mammalian meat contracted by being bitten by a lone star tick, in your article about ticks ("Small But Alarming," July/August).

Thanks to that letter we now have a diagnosis for our son, who has for three years been waking up in the middle of the night with an allergic reaction. Strange thing is that it is always at night. He took the magazine article to his doctor and tested for Alpha-Gal. He tested positive. I'm so glad to finally get an answer to this.

Again, Mr. Muchenfuss, thank you so much for mentioning this. Any future articles about ticks must include information on Alpha-Gal.

Thank you for doing this story.

Connie Poole
Salisbury

write us

Letters should be sent via e-mail to **letters@ncwildlife.org** *or through regular mail to Letters, Wildlife in North Carolina magazine, 1712 Mail Service Center, Raleigh, NC 27699-1712. Please include your name, address and daytime phone number. Letters chosen for publication may be edited for clarity and length. For circulation questions contact William Bolton at 919-707-0285. Editor Jim Wilson may be reached at 919-707-0177 and Associate Editor Mike Zlotnicki at 919-707-0175.*

Locks can tell a story. The top lock is for a British Land Service Musket. It was used virtually unchanged from 1710 to 1839. The smaller middle lock was used on a Pennsylvania Rifle and demonstrates the move from big .75 caliber muskets to smaller bores. The bottom shows the evolution to even smaller caliber muskets such as a squirrel rifle of .36 caliber.

Not A Flash In The Pan

Written by Mike Zlotnicki
Photographed by Melissa McGaw

Gunsmith Dan Hopping loves to craft flintlocks & shoot them

Down in the basement of his northern Wake County home, gunsmith Dan Hopping spends most of his time working on other people's firearms—repairing, customizing or restoring.

For fun he competes regularly in a variety of shooting competitions involving shotguns, rifles and handguns. He also crafts flintlock rifles—firearms that first appeared in the 1600s.

"Most shooters don't know about flintlocks," said Hopping, who retired from IBM in 2006 after 33 years with the company and is now the CEO of Next Retail Group. "They're part history and they're works of art. The gun itself is an original Americana art, just like the dulcimer and the banjo. My understanding is that the dulcimer and the banjo are the only two truly American instruments."

A native of Indiana, Hopping started shooting competitively in high school, taking his .22 rifle on the school bus with its bolt and two boxes of cartridges in his pocket. Once at school it would be stored behind the school secretary's desk until after school.

"Nobody batted an eye," he said. In 1965 Hopping discovered the Kentucky and Pennsylvania long rifles. "I loved the history. They were pretty," he said with a laugh. "When you looked at how the country was formed, the long rifle played a big part."

Necessity being the mother of invention, Hopping started making his own flintlocks in the late '60s because he couldn't find any for purchase. He bought parts back then from Dixie Gun Works, who still sells them today.

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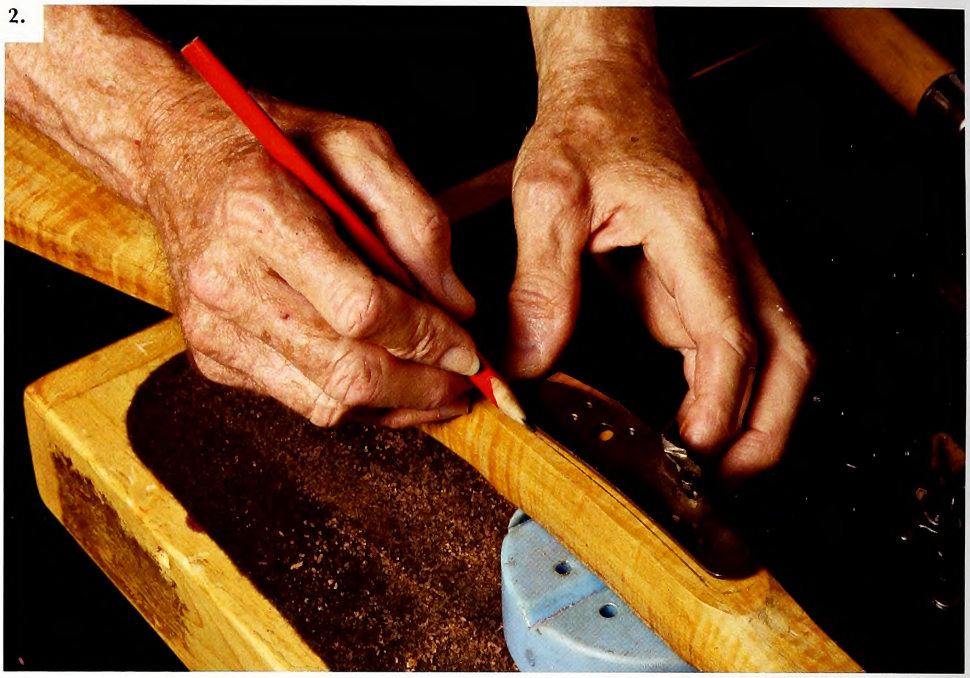

3.

Clockwise from top: **(1) The rifle outline is penciled onto the rough stock blanks and then cut out. (2) The barrel is fitted with tang on top and inletted into the stock. This defines where the lock goes. (3) The lock is inletted into the stock which defines where the trigger and trigger guard go. The rest of the brass hardware is put in place, the ramrod hole is drilled and the stock is then contoured.** ***Opposite page:*** **(4) The stock is contoured with a draw knife, then a hasp, then wood file, then a scraper (shown), then sandpaper, then steel wool. (5) After the parts are installed minor fitting is done to ensure exact fitting. Then, the stock is carved and 10 coats of linseed oil are applied with polishing in between coats. (6) The brass sideplate and other parts are engraved to order and the gun is then sighted in.**

The history of the firelock, as it was called in the 1700s, is as much an interest in the guns for Hopping as the production and use of them. Books like "North Carolina Schools of Longrifles 1765–1865" and "The Frontier Rifleman" fill his shelves. "If you're doing living history, you need to be accurate," he said. "I don't trust modern history on television. For movies, "The Patriot" is mostly accurate, probably the most accurate with garb and weapons. Most people don't know the Revolution lasted eight years and the last five were fought in the South, including almost 400 battles and skirmishes."

If you want to start building flintlocks from scratch, Hopping said that you can buy a kit rifle, but the quality can be lacking. He recommends personalizing a rifle.

"Research where your ancestors lived and recreate their rifle," he said. "Rifle parts are indigenous to specific counties and/or time frames. The physics are the same."

Hopping's flintlocks start with a block of wood, usually curly maple, and usually expensive, somewhere north of $500. On a bench in his cluttered—but not messy—workshop, there were several blanks of raw wood in various stages of progress. It takes about 100 hours, depending on detail, to turn a block of maple into a finished stock.

"Someone can start with an inletted stock blank," said Hopping. "That would save them a month."

Nine rotary power tools hanging from a shelf help Hopping cut time until finer finish and detail work dictate that old-fashioned elbow grease comes into play.

One of the first things to do with the stock blank is to rout the barrel channel on the top of it. The barrel (pre-drilled from the manufacturer) keeps the wood from warping. Once the barrel is mounted it dictates where the locks go, which dictate where the trigger is mounted, followed by the trigger guards and then butt plate. Once the barrel is cut for proper length, the tang is fit into the barrel and a screw will eventually secure the trigger plate through it.

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"What I'm trying to do is make sure people don't forget how our ancestors lived."

The nose cap, butt plate, trigger guard and other metal fittings need to be hand finished and affixed to the wood, where again the elbow grease comes into play. Hopping uses a pencil to mark areas on the wood that need to be worked for metal fitting. The metal locks and trigger guards he buys, and a "good" lock can cost up to $300. Part of the historical accuracy is the type of lock and shape of the stock, which would vary by county and state and by decade.

"The fit of metal to wood is where the craftsmanship comes in," said Hopping. "That's the difference between buying a cheap gun to shoot and building a piece of art. Once it's perfect (the metal to wood fit) I take all of the metal off of it and finish it."

Back in the day, the colonists would have used leaves, tobacco, iron filings and acid to make a good stain. Hopping "cheats," and uses commercial stains with the same chemicals. His barrels are also treated. They are browned (not blued) and Hopping uses commercial solutions to oxidize them. The wood he buys is already cured, but he measures the moisture content as a low measurement is better to work with.

When the maple blank is shaped and fit to his satisfaction, the laborious sanding process starts. He starts with 80-grit sandpaper, then goes to 200, then 400 and 600, all the while spritzing a water mist and putting a heat gun on the wood to raise the

5.

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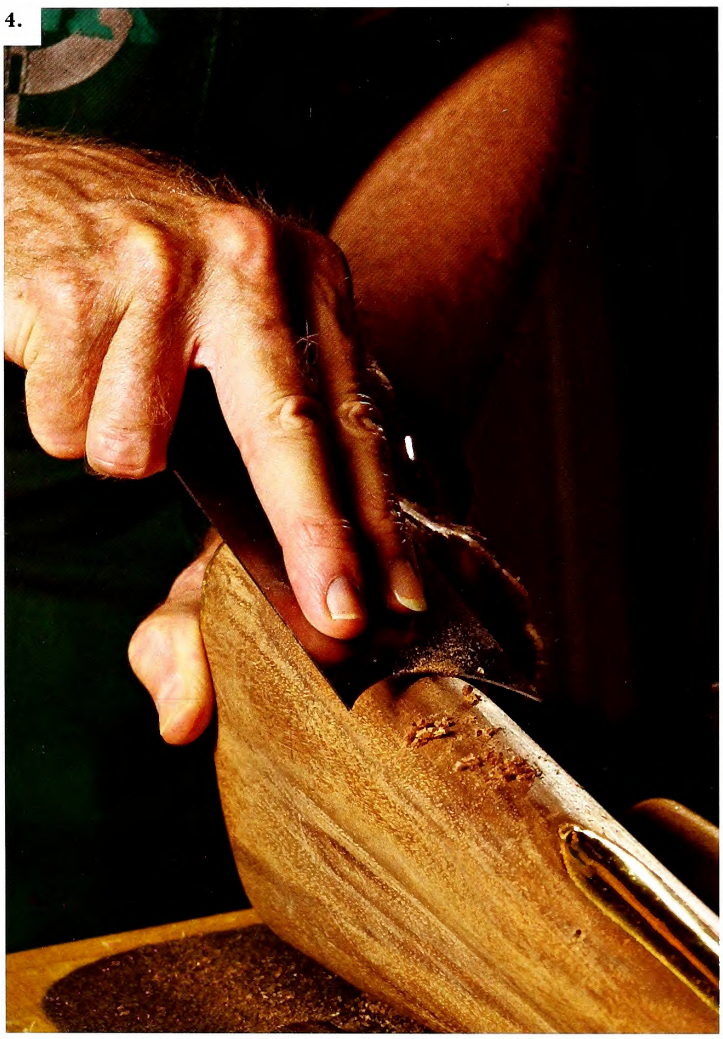

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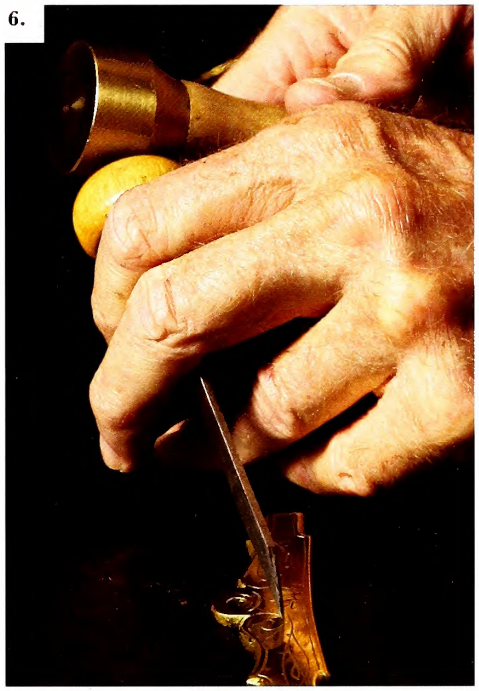


Blackpowder in our language

BITE THE BULLET

Today: Endure the inevitable.
Back Then: Soldiers would clench lead bullets in their teeth to avoid crying out during painful procedures.

LOCK, STOCK, & BARREL

Today: Everything included.
Back Then: The main components of a flintlock.

GO OFF HALF COCKED

Today: Taking action before fully readied.
Back Then: Flintlocks sometimes malfunction in this manner, usually while loading, and the result can be disastrous.

FLASH IN THE PAN

Today: Off to a good start, but no real follow up.
Back Then: The flint would strike the frizzen and ignite the powder in the pan, but not the powder in the barrel.

KEEP YOUR POWDER DRY

Today: Be prepared.
Back Then: Literally, keep your gunpowder dry.

LOOSE CANNON

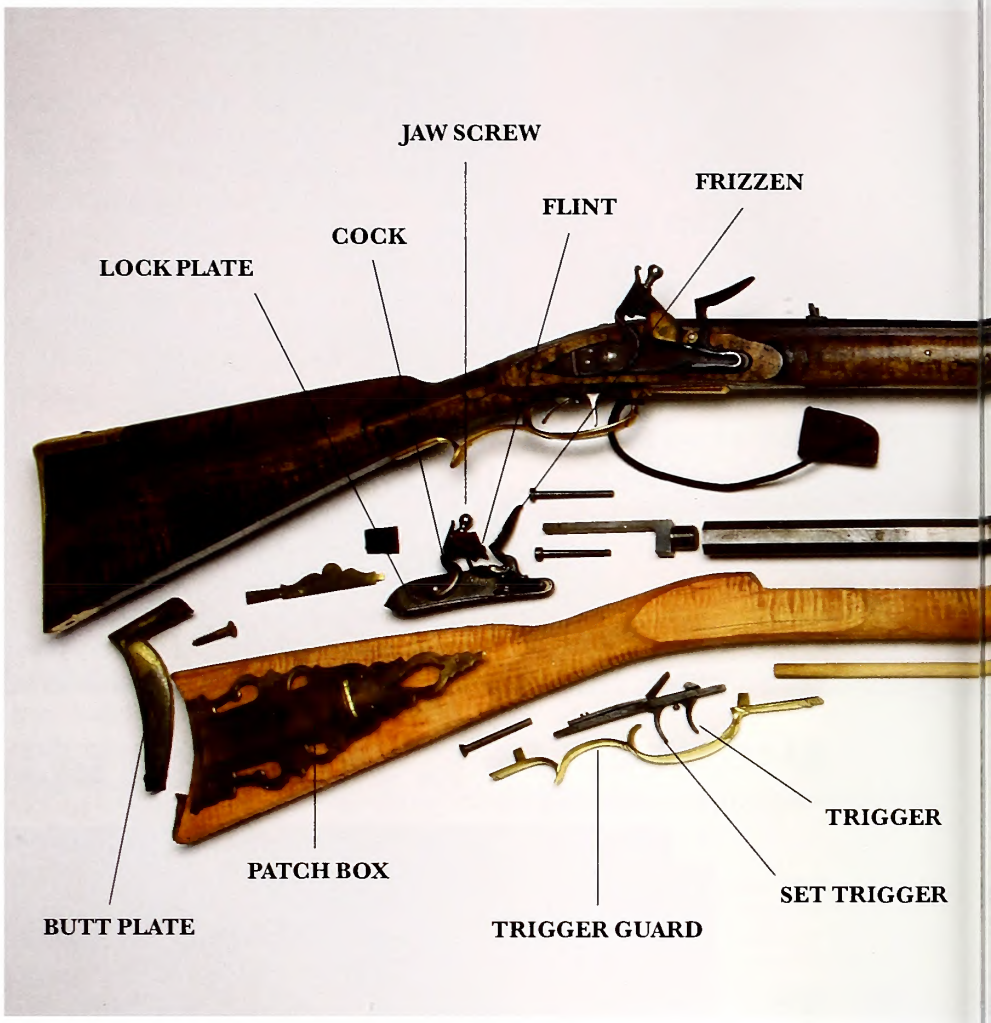
Today: A trouble maker or rogue.
Back Then: A loose cannon on a ship could shift and roll into other equipment or the hull.

LOCK & LOAD

Today: Get ready for action.
Back Then: Part of the sequence of loading a flintlock.

RAMROD STRAIGHT

Today: True, even or morally correct.
Back Then: A ramrod is used to load a flintlock, and a crooked ramrod wouldn't function correctly.



"whiskers," tiny pieces of wood in the grain that come loose. He'll end up using 0000 steel wool to finish.

"The majority of error in building a gun is in the wood," he said. "To have a finish that looks like this," he said, holding a finished rifle, "I'll use 10 coats of linseed oil and 0000 steel wool between each coat."

As he held the rifle the curly maple grain changed like a hologram as he turned the piece. But not all guns are this pretty.

"Sometimes, 'period correct' can be pretty rough," he said. "The difference between a gun made in North Carolina and a Boston gun maker who used Revere for his inlays could be night and day."

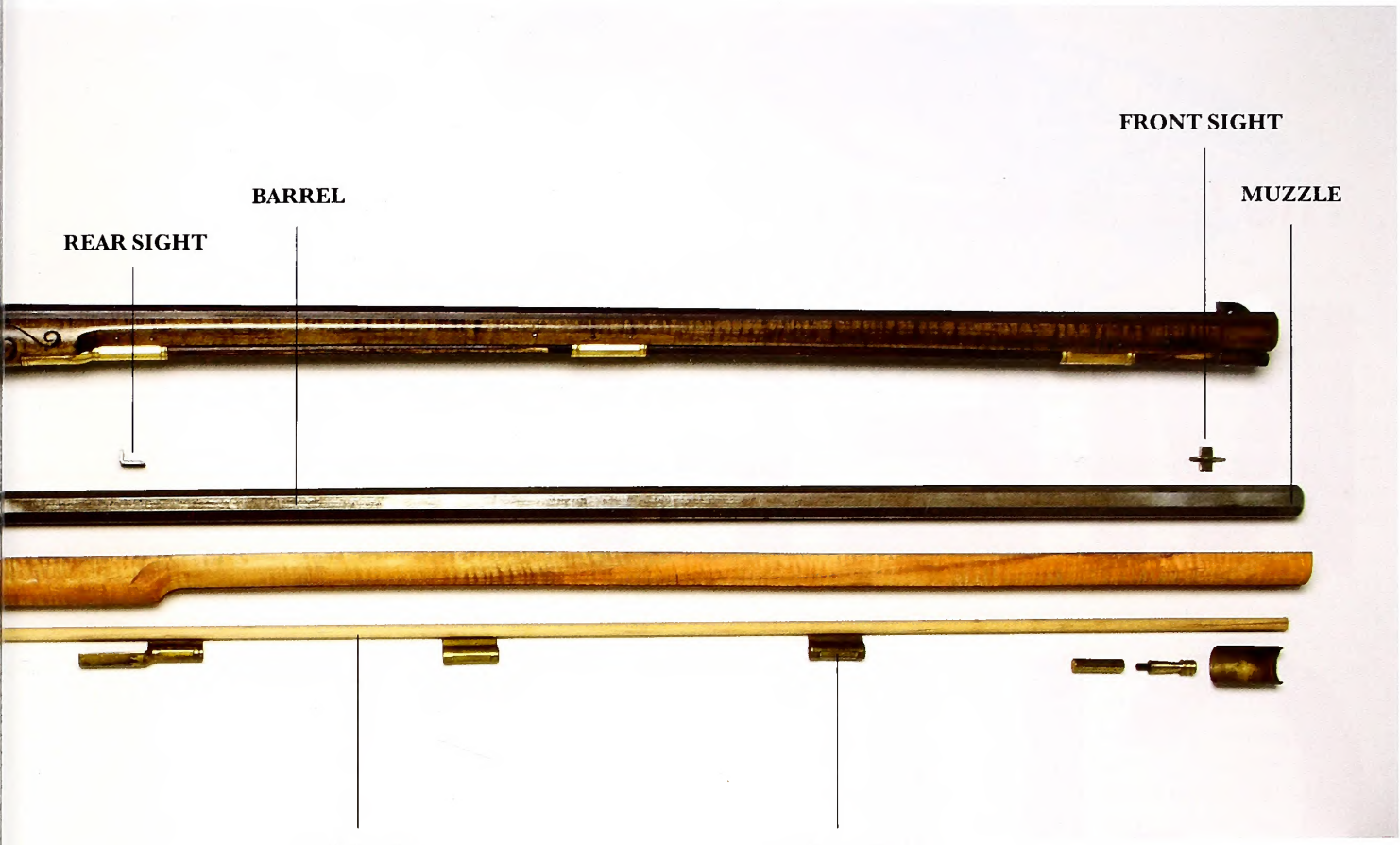
Hopping's interest in the flintlock transcends the firearm. He counts 14 of his ancestors as participants in the Revolutionary War and is an active member in the local chapters of the Sons of the Revolution and is in the Sons of the American Revolution color guard, which marches every November in the Veteran's Parade in Raleigh. He also creates his own period clothing from various types of leather, including a wild boar he killed in Tennessee with a flintlock.

"My liking for the flintlock is kind of based on when I got interested in genealogy," he said. "What I'm trying to do is make sure people don't forget how our ancestors lived. Most of the people in the revolution were farmers with an anti-government bend."

That historical interest and personal satisfaction are good things, because, Hopping said, the flintlocks don't make a whole lot of business sense at hundreds of man-hour per gun.

"I don't keep track of the time," he said with a laugh, "because if I did I'd quit building them. I could get $3,000 to $4,000 per gun, if I sold them, but if I did I'd make like 40 cents an hour. And, by the time I'm done, they're family."

Mike Zlotnicki is the associate editor of Wildlife in North Carolina. *He may be reached at mike.zlotnicki@ncwildlife.org or 919-707-0175.*



(1) Lead musket balls ready for use. Early Americans favored smaller caliber guns than their European counterparts. (2) Flint pieces ready for use. (3) This is a cock with a flint cushioned in leather and snugged down with the jaw screw.

2.

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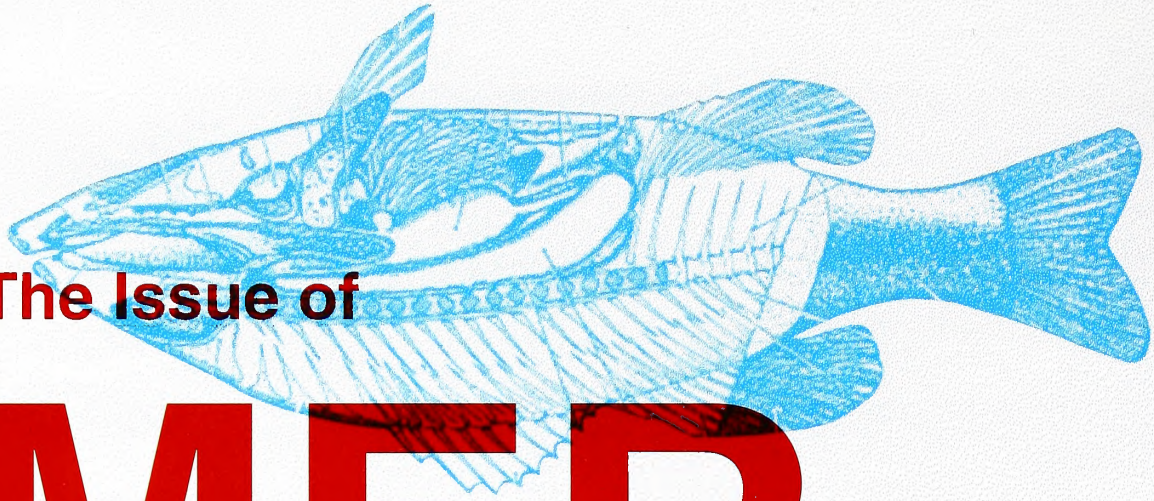
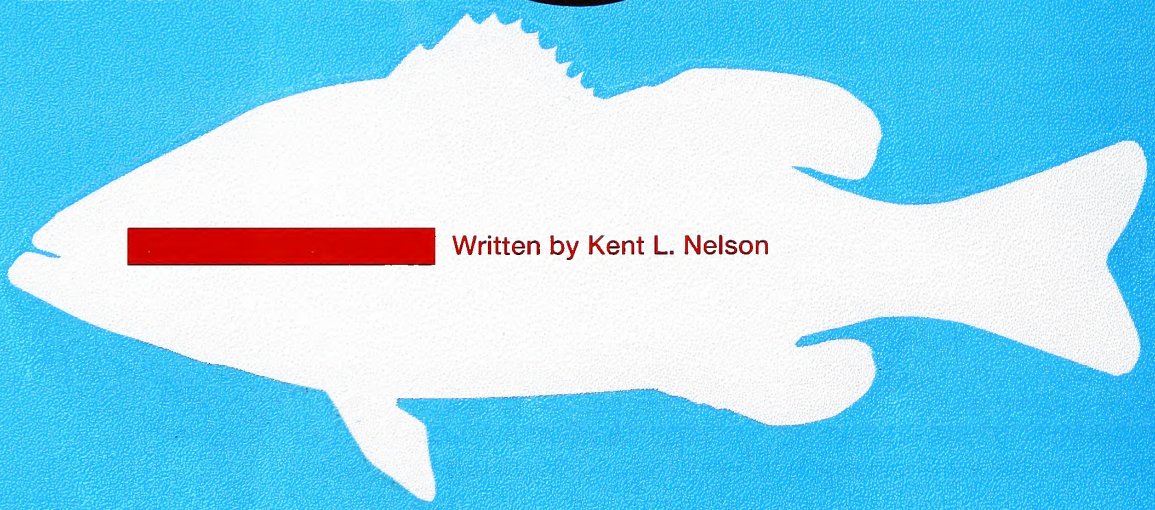
1.



The Issue of

MER-CURY & FISH



Written by Kent L. Nelson

WE'VE SEEN THE PUBLIC HEALTH WARNINGS, BUT HOW DOES MERCURY CONTAMINATE FISH AND WHAT CAN BE DONE ABOUT IT?

A review of freshwater and saltwater fishing information in North Carolina published by the N.C. Wildlife Resources Commission and the Division of Marine Fisheries references fish consumption advisories for some fish species due to mercury levels, including largemouth bass, walleye, black crappie, cobia, Spanish and king mackerel, swordfish, sharks and tilefish. The N.C. Division of Public Health (NCDPH) within the Department of Health and Human Services is responsible for issuing health advisories and has compiled a list of fishes determined to contain high, as well as low levels of mercury, and has recommendations for eating fish that are based on this list. Women of child-bearing age and children have more restrictive limits on consumption. Wild-caught fishes identified as low in mercury include bluegill, mountain trout, black drum, croaker, spot, flounder, pompano and red drum. How are fish tested and are they safe to eat? What is responsible for this widespread problem and can anything be done about it?

SOURCES AND FATE OF MERCURY IN THE ENVIRONMENT

Mercury is a naturally occurring metal found at very low levels in rock, soil and water. It exists in several forms and at room temperature is the shiny, silvery liquid that anyone who has broken a thermometer is familiar with. When heated it becomes a colorless, odorless gas and is released into the atmosphere by both natural processes and industrial activities. Natural processes, including volcanoes, geothermal activity, weathering of soil and rock and wildfires, may account for approximately 33 percent of the worldwide mercury emissions into the atmosphere. In 2006, coal-fired power plants accounted for an estimated 50 percent of the total manmade mercury releases in the U.S. and approximately 75 percent of emissions in North Carolina. Other sources included municipal and medical waste incineration, cement and chlorine manufacturing, steel mills and ore processing.

NORTH CAROLINA DIVISION OF PUBLIC HEALTH FISH RECOMMENDATIONS FOR CONSUMPTION

Women of childbearing age (15 to 44 years), pregnant women, nursing mothers and children under age 15:
Do not eat fish high in mercury and eat up to 2 meals per week of fish low in mercury.

All other individuals:
Eat no more than one meal per week of fish high in mercury and eat up to four meals per week of fish low in mercury.

For the lists of fishes see:
www.epi.state.nc.us/epi/fish/ or call 919-707-5900.

Mercury is used in fluorescent and neon lights, including the energy-efficient compact fluorescent lights (CFLs), bug zappers, high pressure sodium bulbs, mercury switches in vehicles, batteries and teeth fillings. Improper disposal of these products can also discharge mercury.

Mercury is released into the atmosphere in elemental, gaseous and particulate forms, and because it is not broken down by heat or decomposition, it persists in the environment and is cycled among air, land and water. Mercury taken up by vegetation can be re-emitted to the atmosphere during forest fires and burning, while mercury deposited in soils and sediment may be released again by rain or floods to enter aquatic systems. The fate of mercury released into the atmosphere is complex and incompletely understood, depending on its chemical form, the height at which it is released, atmospheric and ecosystem characteristics. Mercury emitted to the air from industry may be deposited locally or transported long distances in the atmosphere.

Florida studies found that the majority of mercury emissions from coal-fired power plants and waste incinerators, in the form of mercuric chloride, were deposited within 150–200 miles during dry weather and within 50 miles when it rained. Besides being deposited domestically, about two-thirds of coal-fired power plant emissions are released into the atmosphere and deposited elsewhere, according to estimates from the U.S. Environmental Protection Agency (USEPA). It's also estimated that airborne emissions account for nearly all (98 percent) of the mercury reaching North Carolina waters, of which 84 percent are from out-of-state sources and 16 percent from instate power plants and other industries. By 2015, 97 percent of the airborne mercury deposited in North Carolina waters is projected to be from out-of-state sources. Mercury is, therefore, considered a global pollutant and atmospheric transport results in noticeable levels of mercury deposited in remote, undeveloped regions.

After deposition, mercury can be converted into methylmercury, the biologically active and highly toxic form, primarily by microbial action through a process called methylation. It is methylmercury that enters the aquatic food chain and concentrates in fish tissue. Americans are principally exposed to methylmercury by eating fish, and because it is contained within the muscle and not the fat or skin, it cannot be trimmed away.

Knowing which fish are low in mercury and being familiar with safe eating guidelines help anglers make informed decisions about eating fish.

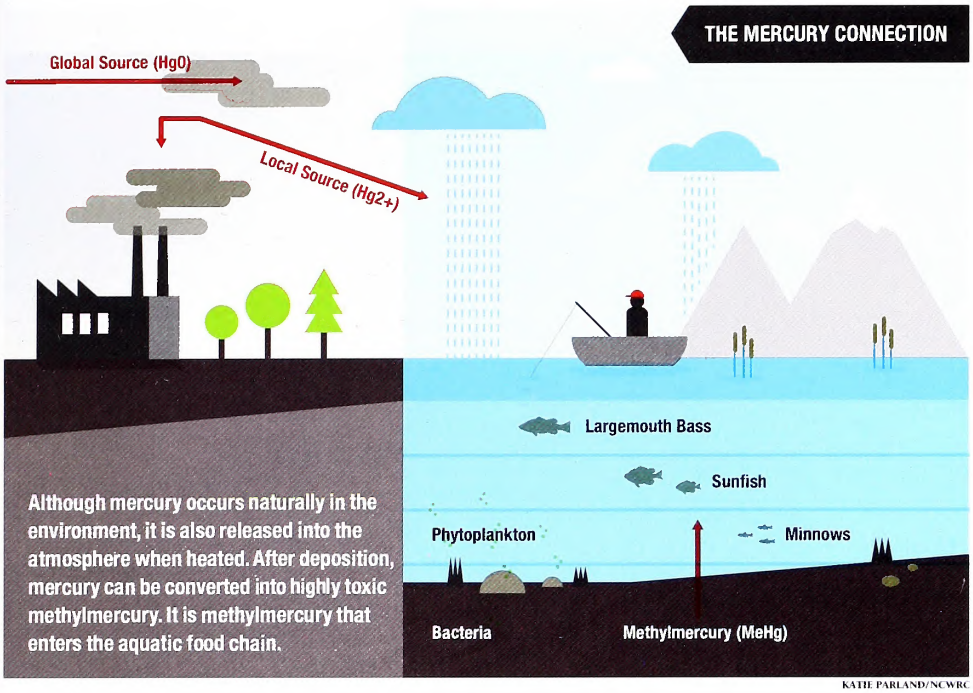
HEALTH EFFECTS

Methylmercury has toxic effects on the nervous system, including nerve cells in the brain and spinal cord. The developing nervous systems of unborn babies and young children are considered especially vulnerable. Case studies of children whose mothers consumed high levels of methylmercury-tainted fish show impaired abilities to walk and talk and exhibited mental problems. Thus, the basis of recommendations that women of childbearing age, pregnant women, nursing mothers and children under age 15 not eat fish high in mercury and eat lower amounts of fish low in mercury.

BIOLOGICAL AND ENVIRONMENTAL INFLUENCES

The species of fish, their size, age and feeding habits all help determine the relative amounts of methylmercury they contain. Within a species, older and larger fish typically contain greater amounts of mercury and, with other factors equal, faster growing individuals have less mercury than slower growing ones at the same length. Highest levels of methylmercury are found in predatory (fish eating) species at the top of the food chain, such as largemouth bass and sharks, whose diets consist of other fishes. Fish that feed on vegetation and aquatic organisms such as plankton and insects contain relatively lower levels of mercury. This bioaccumulation of contaminants that may increase at each level of the food chain, including humans, is also referred to as biomagnification, an effect similarly observed with DDT, PCBs, chlordane and dioxins.

Environmental factors also play a role in the amount of methylmercury found in fishes. A recent study: "A Statewide Assessment of Mercury Dynamics in North Carolina Water Bodies and Fish" by Dana Sackett, D. Derek Aday, James Rice, and W. Gregory Cope at N.C. State University (NCSU), found that the geographic ecoregion, pH (acidity of the water), land use (amount of agriculture) and water type (swamp, river or lake) helped determine and predict mercury concentrations in North Carolina fishes. Other researchers have observed that a water's alkalinity, dissolved oxygen content, and amounts of sulfates and dissolved organic carbon also influence methylmercury production. The warm, slightly acidic, and highly organic blackwater streams and lakes of eastern



Although mercury occurs naturally in the environment, it is also released into the atmosphere when heated. After deposition, mercury can be converted into highly toxic methylmercury. It is methylmercury that enters the aquatic food chain.

KATIE PARLAND/NCWRC

What Makes Mercury So Dangerous?

See Nature's Ways, page 43.

North Carolina are especially vulnerable to mercury pollution and fishes in this region typically contain relatively higher methylmercury levels. Mercury levels in fish have also been found to increase following flood events, which may introduce additional mercury into receiving waters via runoff and organic matter, thereby facilitating methylation by bacteria.

TESTING NORTH CAROLINA FISHES FOR MERCURY AND FISH CONSUMPTION ADVISORIES

Health advisories recommending limits on the amount of fish eaten are issued by state and federal agencies including the NCDPH, USEPA and U.S. Food and Drug Administration. The USEPA reported in 2006 that 35 states had issued statewide consumption advisories for mercury with most new advisories believed to be the result of increased monitoring rather than increased releases of mercury within the U.S. The North Carolina Division of Water Quality (NCDWQ) within the Department of Environment and Natural Resources began testing fish for mercury in 1980, with these data serving as a basis for NCDPH fish consumption advisories. The action level for these advisories is an average tissue concentration of total mercury (primarily methylmercury) of 0.4 milligram/kilogram (mg/kg) of fish tissue, equivalent to 0.4 part per million, or greater. Individual fillets of harvestable size fish are routinely tested, and Jeff DeBerardinis with NCDWQ in Raleigh reports that its lab typically processes and analyzes 400–500 fish samples annually with over 7,500 fish tested since 1990. The Wildlife Resources Commission assists in the process by collecting fish, as well as identifying species frequently eaten by anglers in different regions. Initial testing targeted predatory species with broad geographic ranges, including largemouth bass and crappie, and focused on eastern North Carolina, where methylmercury accumulation is greatest. Over the past several years, additional species and locations have been sampled under a cooperative project between the Wildlife Resources Commission and NCDWQ. This testing resulted in NCDPH issuing consumption advisories for walleye in lakes Santeetlah, Fontana, Gaston and Nantahala; smallmouth bass and yellow perch in Lake Nantahala; and white bass in Lake Chatuge.

Bluegill and mountain trout are the only wild-caught freshwater species identified on the NCDPH list of fishes low in mercury. Other freshwater fishes listed as low in mercury are aquaculturally raised catfish, trout, tilapia and crayfish. In comparison, 28 species of marine fish and shellfish are listed as low in mercury. NCDPH's understandable emphasis is on identifying species containing high levels of mercury which tends to be more prevalent in freshwater species and their general approach to issuing advisories account for this discrepancy. A variety of wild-caught freshwater fishes do, however, contain low levels of mercury (less than North Carolina's 0.4 mg/kg criterion) and recreational and subsistence anglers will benefit from this information. Recent sampling from coastal rivers indicated low levels in striped bass, white perch, redear sunfish, pumpkinseed, hickory and American shad. Also, 94 percent of smallmouth bass in western North Carolina waters (South Fork New, French Broad, Tuckaseegee, and Little Tennessee rivers and Lake Hiwassee) were low in mercury.

As previously discussed, geographic, biological and environmental influences affect methylmercury accumulation, thereby making it difficult to list fish on a statewide basis. Black crappie, noted by NCDPH to contain high levels of mercury south and east of Interstate 95, were found in the low range from six Piedmont reservoirs sampled in 2007. Similarly, spotted bass, channel and blue catfish exhibited low levels in some waters. Low levels of mercury are also found in predatory species, such as largemouth bass, at a young age before methylmercury has had time to accumulate. To take advantage of this relationship, length-based advisories would need to be developed for specific ecoregions or waterbodies, an approach taken in other states, such as New York and Wisconsin. Reducing fish length limits or providing exceptions to minimum lengths would also allow anglers to harvest fish before mercury levels become problematic.

ARE FISH SAFE TO EAT?

Many recreational anglers, their families and friends enjoy eating the fish they catch. Guidelines consistently state that a variety of wild-caught fish and shellfish may be eaten safely and are considered an important part of a healthy, balanced diet. Fish are an excellent source of protein and other nutrients, including omega-3 fatty acids, and are low in saturated fat. Knowing which fish are low in mercury and being familiar

Recently retired Wildlife Commission fisheries biologist Keith Ashley nets American shad, a species that has not yet been tested for mercury levels. The commission itself does not issue fish consumption advisories.

MELISSA McGAW/NCWRC

MORE INFORMATION ON MERCURY IN THE ENVIRONMENT AND HEALTH ADVISORIES:

North Carolina Department of Health and Human Services

Mercury facts:
http://epi.publichealth.nc.gov/oee/a_z/mercury.html

Fish consumption advisories:
www.epi.state.nc.us/epi/fish/

North Carolina Department of Environment and Natural Resources

Fish tissue mercury sampling:
http://portal/ncdenr.org/web/wq/ess/bau/fish-tissue-data

2012 report to the Environmental Management Commission on the control of mercury emissions from coal-fired electric steam generating units:
http://daq.state.nc.us/news/leg/Mercury_Report_7-1-12.pdf

U.S. Environmental Protection Agency

Mercury home page:
www.epa.gov/mercury/

Fish advisories index:
http://www.epa.gov/mercury/advisories.htm

Description of Global Emissions and link to U.N. (2008) report:
www.epa.gov/mercury/control_emissions/global.htm#world

with safe eating guidelines help anglers make informed decisions about eating fish. Fish high in mercury should not be eaten if you are within a sensitive group (children and women of childbearing age.) For more information on eating fish refer to the references listed in this article.

WILL MERCURY POLLUTION CONTROLS WORK?

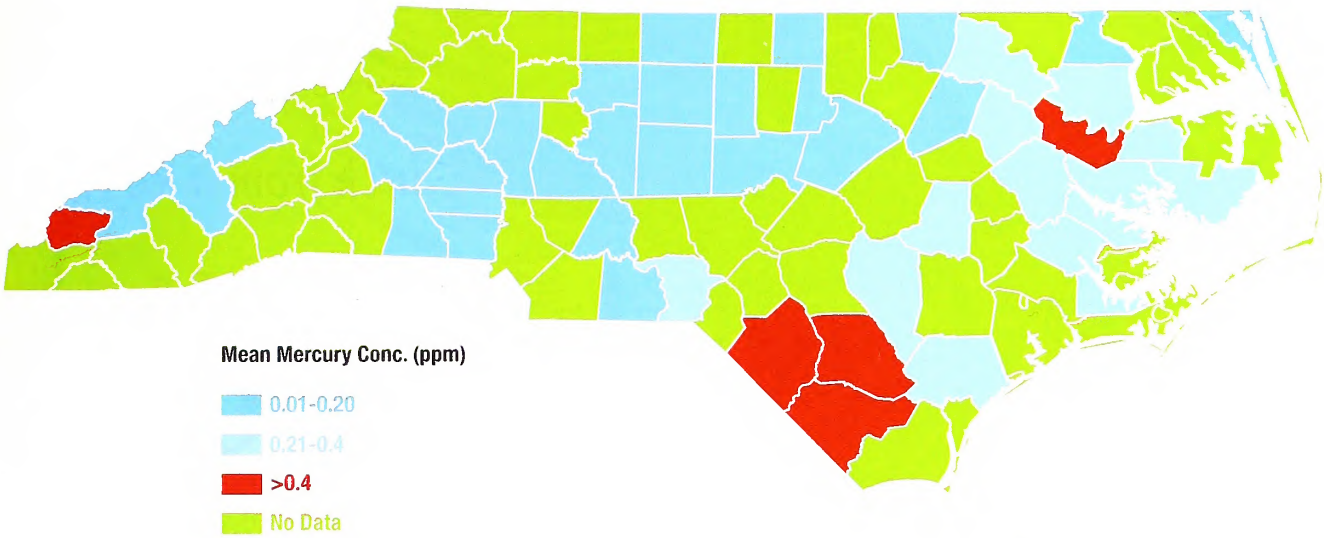
Actions to limit mercury emissions are ongoing at the federal and state levels. Congressional action to limit the use of mercury in batteries and USEPA regulatory limits on municipal, medical and hazardous waste incinerators, contributed to a reduction of mercury emissions during the 1990s. These efforts have yielded positive benefits for controlling mercury pollution, with the U.S. Department of Energy (USDOE) reporting a decrease in the amount of mercury being deposited in the U.S. in the 1990s from about 242 to 160 tons per year.

USEPA has recently set new emission standards for mercury and other hazardous air pollutants for coal-fired power plants and in the near future, plans to set new mercury emission standards for existing and new sources. These will include rules for industrial, commercial, and institutional boilers that burn coal and other fuels; commercial and industrial solid waste incinerators; steel mills with electric arc furnaces; and Portland cement plants.

In North Carolina, the General Assembly enacted Session Law 2002-4 (the "Clean Smokestacks Act"), which requires significant emissions reductions from the state's coal-fired power plants. Under the act, nitrogen oxides (NOx) and sulfur dioxide (SO2) emissions which contribute to acid rain, ozone, haze and other air quality problems must be reduced. A significant co-benefit resulting from controlling these pollutants is a reduction in mercury emissions. A recent N.C. Division of Air Quality study found that mercury emissions from North Carolina coal-fired power plants have been reduced by more than 70 percent, thanks to pollution control measures taken by utilities.

"The Clean Smokestacks Act and other state and federal programs have cut mercury emissions from all sources in North Carolina by nearly two-thirds," said Mike Abraczinskas, Deputy Director of the N.C. Division of Air Quality. "The top 25 sources in the state emitted just over 5,000 pounds of mercury into the air in 1999. Today, that number is less than 2,000 pounds per year. We expect further emissions cuts in the coming years due to the utilities' plans to retire some coal-fired units and new federal requirements on boilers and incinerators."

Recycling is also an important way of reducing the release of mercury into the environment. Currently six states, including California, Minnesota, and Maine, require the recycling of mercury bulbs, including CFLs. In 2005, North Carolina passed a mercury switch removal program



Average mercury concentrations in black crappies, 1990–2012. White crappies have yet to be tested for mercury concentrations.

for scrapped vehicles which was followed by a national program in 2006. The new Mercury Products Recycling Grant Program initiated by the N.C. Department of Environment and Natural Resources assists counties and municipalities in creating or expanding recycling programs for mercury-containing products. Some businesses also provide recycling services, including Lowes and Home Depot, while other companies provide mail-in recycling services.

Under the Clean Water Act the USEPA also established Methylmercury Fish Tissue Criterion (= 0.3 mg methylmercury/kg of fish tissue) to protect the health of all consumers of wild-caught freshwater and estuarine fishes and to help guide state water quality standards. In October 2012 the USEPA approved North Carolina's Department of Environment and Natural Resources statewide Total Maximum Daily Load for mercury into state waters with the overall goal of reducing mercury levels in fish to safe levels.

These positive reductions are tempered by an incomplete understanding of the complex cycle of mercury transport, deposition and uptake and a global reality. A United Nations (U. N.) report in 2008 listed Asia, primarily China, as supplying 66 percent of the global man-made mercury emissions, followed by India and the U.S. North America is estimated to contribute about 8 percent of the global emissions. Trends from 2000 to 2005 show increased emissions from China and India that were attributed to economic and industrial development. As such, significant amounts of mercury continue to be introduced into the environment and atmospheric transport guarantees it will be deposited over widespread areas. The U. N. report further stated that the relatively lower reduction in mercury deposition observed in the U.S. in comparison to Europe is partially explained by emission patterns in Asia. The report concluded that national and international action to control mercury emissions can yield substantial reductions, but future trends depend on many variables, including economic growth, development and use of emission control technology, regulations and the potential effects of global climate change.

Given that much of the mercury deposited in our state comes from abroad, it is encouraging that global activities to mitigate mercury releases are being organized under the U. N. Environment Program (UNEP). UNEP is preparing a legally-binding framework to reduce the worldwide supply, storage, trade and release of mercury with international partnerships focusing on limiting mercury releases from major sources, notably coal combustion and gold mining. Through this U. N. program, significant reductions in mercury emissions from participating countries are anticipated over the next 10–20 years.

To evaluate long-term trends in mercury levels in North Carolina fishes, a cooperative study between NCDWQ and Division of Air Quality began in 2008 at 13 locations across the state, including sites near major coal-fired facilities. While no statistically significant declines in fish tissue mercury levels near coal-fired power plants have been found to date, it may take decades for a reduction to be realized. With most mercury reaching North Carolina waters originating from out-of-state airborne emissions, limiting these introductions in addition to instate actions may be key to reducing mercury levels in North Carolina fishes. In addition, it takes considerable time for mercury to work through ecosystems and since it does not degrade, it must be buried sufficiently in sediments or otherwise isolated, to be removed from the food chain. Only time will tell how long it will take to see a decline in methylmercury levels in North Carolina.

Kent Nelson is a retired fisheries biologist with the N.C. Wildlife Resources Commission's Division of Inland Fisheries.

Written by Ian Privette | *Illustrated by Gary Palmer*

Hunting the Carolina duck from a kayak

A Different Look at

First Light

The early morning clouds that linger over the eastern horizon almost seem purple in the predawn light. A thin band of moonlit blue exposes a cracked tree line of ancient oaks and cypress. I glance down at my watch and take a deep breath. Five more minutes. My kayak gently sways in the tiny creek's subtle current that is mirroring my sparse spread of decoys. I feel my heart pounding through three layers of clothes as I load a 2¾-inch shell in my top barrel. A hen wood duck squeals off in the distance. I quickly load my bottom barrel. It is almost time. I can hear the faint, nasally "twzeeeee" of a drake already on the water and I am surrounded by the sounds of unseen ducks. The soft thunder of 3-inch shells from other guns echoes from the main river and I take another deep breath. Any second now…

My eyes continue to scan the sky for silhouettes and I hear a pair of wings pass through the limbs behind me. I slide my thumb removing my gun's safety as three woodies bank sharply 10 feet above me and close in like jets in attack formation. I pick out a patch of white and pull the trigger and the morning's first duck splashes on the water. The two remaining woodies retreat to the tree line and my nerves relax. My kayak put me right where the ducks wanted to be. The cold air catches and condenses my breath like the burnt gunpowder escaping from the breach of my gun. I hear the sounds of more woodies hidden in the swamp's high tide and I pick up my decoys. If I'm quiet, and pick the right lanes, I know I still have a chance at more ducks.

Only a duck hunter knows the overwhelming sense of excitement and anticipation in the moments just before shooting time. While most people are happily asleep and blissfully unaware of nature's morning routine, a duck hunter is determined to brave the elements and the 4:30 a.m. alarm to witness a sunrise filled with such suspense and optimism. And a kayak puts you right in the middle of the action.

For many years, kayaks have won over an increasing number of anglers as a viable and effective way to fish. With its ease-of-access, low profile and quiet approach, it's no wonder that kayaks have found a niche in waterfowling in smaller waters. And, as North Carolina duck hunters know, the wood duck calls these waters home.

Wood Ducks aren't Big Water Ducks

The colloquially coined Carolina duck tends to favor the shallow waters of swamps, small creeks and beaver ponds that are abundant throughout the state and much of the South. The most familiar approach among duck hunters is to simply walk in to a roost with waders on or set up with a small boat along a river, hoping to intercept woodies as they fly from their roost to feed. In either case, wood ducks will often fly with a certain destination in mind. A walk through the swamp in the dark can be treacherous, and pass shooting on the river can be short-lived. But a kayak has the ability to negotiate these smaller patches of water safely and can put a hunter exactly where the wood ducks want to be. A kayak can turn a 15-minute hunt into an hour or more.

All a Kayak Needs is Access to Water

Unlike most duck boats, a kayak only draws a few inches of water, allowing the hunter to

slip into areas that conventional boats could never reach. Likewise, specially designed carts are available to facilitate carrying a kayak over long distances, allowing passage over beaver sloughs and through swamps that hunters would not normally have access to by foot or trailer. Brands such as Perception, Old Town, Hobie and Pelican offer comfortable fishing kayaks that can be converted to hunting with the simple addition of camouflage netting or a custom paint job. Rather than paying for expensive stencil kits and spray paints, I spray painted my own kayak with tan, green and black flat-finished paints purchased from the hardware store, using homemade cardboard cut-out stencils designed to look like marsh grass and tree bark. Due to the various developments in stability, weight and design, along with the recent increase of popularity, the price of a kayak can vary from as low as $200 up to $2,000. Whether it is a sit-in or sit-on-top kayak, a hunter has an array of options to fit his budget and preference. Along with access to more water, the kayak allows a hunter a lower profile on the water for better concealment, and positions the hunter closer for more productive shots. It also offers a quick and efficient way to retrieve downed or crippled ducks.

For many years, kayaks have won over an increasing number of anglers as a viable and effective way to fish.

Public Hunting Access Isn't a Secret

The N.C. Wildlife Resources Commission does an excellent job of providing its hunters with the resources and information they need to be successful. On its website, ncwildlife.org/Hunting.aspx, a series of links literally walks a hunter, step by step to the nearest public land hunting opportunities—from interactive maps to regulations affecting specific game lands. There is even a downloadable file that accurately details and defines game land boundaries on Google Earth. However, finding a productive wood duck spot among the two million acres of North Carolina game land can be difficult if not frustrating. Successful hunters understand it is all about how you use that information that makes the difference. Here are a few tips you might find helpful.

Finding the Right Place at the Right Time

Waterfowl monitoring and banding reports in North Carolina suggest that wood ducks follow a slightly different, radial dispersal pattern of migration compared to the traditional north-south flyways of other ducks like mallards, teal and pintails. Preseason scouting can be beneficial in locating high concentrations of woodies and is also a good way to familiarize yourself with the water and your kayak. (Five o'clock in the morning in the pitch-black swamp in an endless maze of cypress and oaks is not the best time to be exploring new terrain.) That is not to say, however, that in-season scouting should be ignored. The absence of wood ducks in one particular spot during the early season does not necessarily mean it will not become a haven for resident or migrating populations later on.

A good rule for hunting public land is, if it takes a little more effort to find a spot, it is usually worth it. It might take a good amount of scouting to get away from the crowds. And it might take a few times of seeing ducks and setting up in the wrong spot to finally pin down where the ducks want to be. Extra effort, patience and persistence have the potential to make great early morning hunts. Depending on local regulations, drifting in your kayak after a hunt to scout new locations can lead to some phenomenal jump shooting opportunities.

Hunters should also keep in mind that woodies don't handle shooting pressure the same as other ducks. It doesn't take much pressure for wood ducks to abandon a heavily used feeding area for a more secluded one away from the barrels of eager waterfowlers. It is a good idea to have three or four places scouted out during the season to increase your success.

Who says Woodies don't Deke?

Decoys work. However, wood ducks don't respond to decoys the same way as other puddle ducks do. Wood ducks are either coming in fast and fully committed or they are not. A well-timed call might turn a small group for

another look but don't expect multiple passes seen in other species. Decoys, at the very least, provide a hunter the chance for wood ducks to fly close enough for a good shot.

The wood duck is a unique species among North American ducks. Its closest and only living relative, the mandarin duck, is found in the waters of eastern Asia. If woodies are used to sharing the same feeding areas with other ducks, mallard decoys may work, but most of the time woodies are looking for their own area. Wood ducks primarily feed on acorns and aquatic vegetation just below the water surface and often swim in and out of flooded areas foraging for food. As with other hunting, look for food sources and your success rate is bound to increase.

When hunting from a kayak, a smaller spread of wood duck decoys grouped in two's and three's tucked next to a flooded timberline suggests a more natural feeding presentation than a larger group in open water. A kayak's low profile allows a hunter to set up closer to the decoys while maintaining an appropriate level of concealment along the marshy bank, much like the technique of hunting snow geese from ground blinds.

Sitting Down to Shoot

Shooting while sitting down can take some getting used to. Practicing on a clays course from the sitting position may attract funny looks from spectators, but will prepare a hunter for the type of shots taken from a kayak. Ideally, most shots at wood ducks from this position should be at 20 yards. The ducks will be on top of you before you realize it. At this range, 2¾- or 3-inch No. 4s (or even 6s) is an appropriate duck load. Many small creeks, swamps and beaver ponds have tiny pockets of dry land (hummocks) or islands where a hunter can stand to shoot. The true versatility offered by a kayak changes a hunter's perspective from "*where can I hide the boat?*" to "*where can I have the best shot?*"

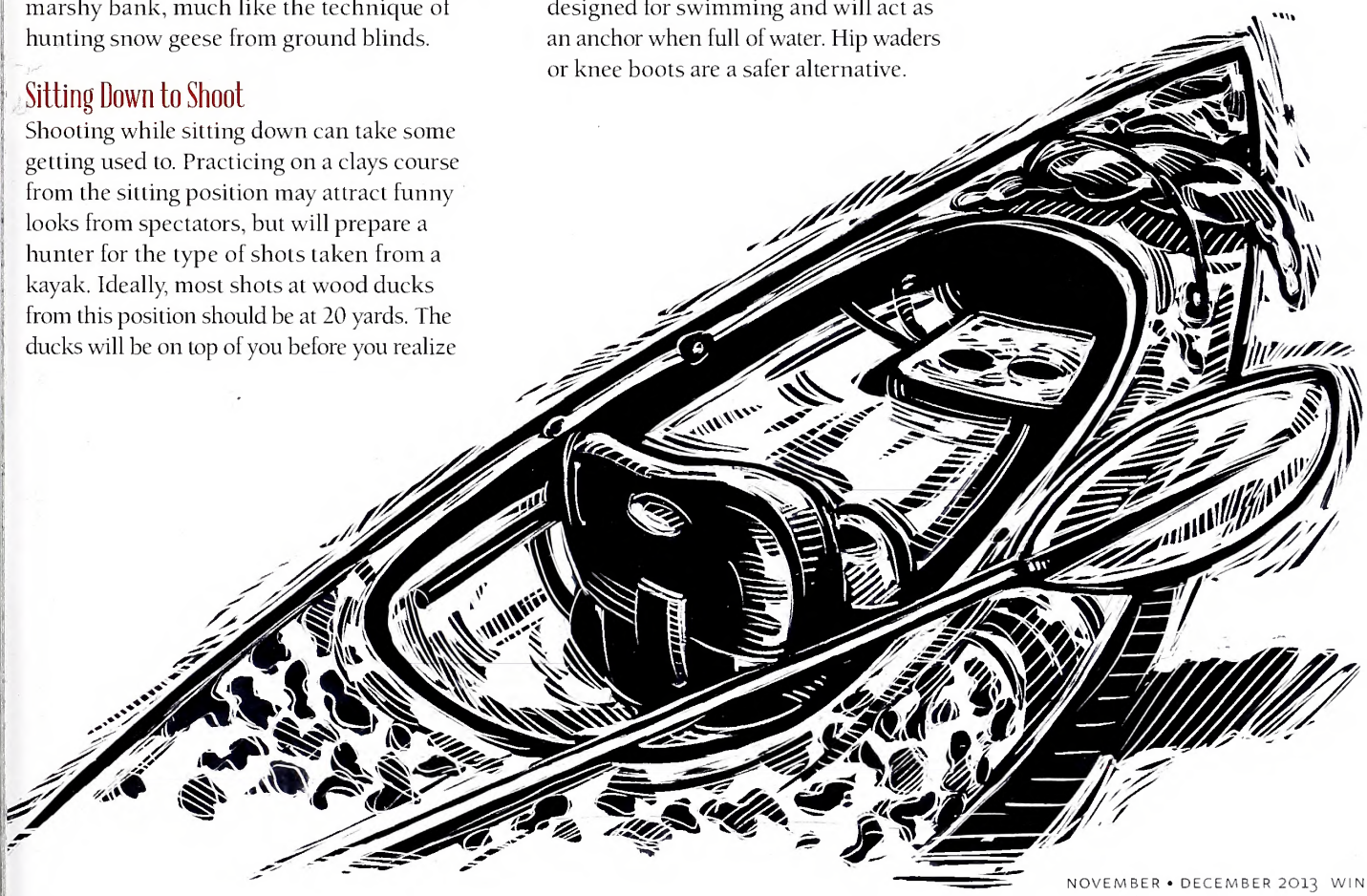
Be Prepared

A duck hunter should always be prepared for the worst. If something can go wrong, it probably will. The water is never just waist deep and there is no such thing as tangle-free decoys on more than 3 feet of line. To stay safe on a kayak:

- Know the water before the hunt. Your surroundings look different in the dark, tides change and water levels rise and fall.
- Tie down everything valuable in case of a flip. Parachute cord is a hunter's best friend. The bottom of a beaver pond is the worst place to dump your shotgun.
- Do not wear waders. Waders were not designed for swimming and will act as an anchor when full of water. Hip waders or knee boots are a safer alternative.
- Wear a life jacket. Most life jackets and Personal Floating Devices are available in camo and small enough not to impede good shooting. Some PFDs have CO2 and activate upon hitting the water. A PFD is a life-saving investment.
- Stay off big and bad water. River currents can be dangerous, especially in the dark, and the risk of flipping over increases. A kayak's low profile makes it difficult for other boats to see.

With proper preparation and suitable safety precautions, a kayak offers today's duck hunter a low-cost means of getting into the sport and an efficient way to access more water and ducks. For novice and seasoned wood duck hunters alike, the kayak is a great tool to enhance your tactics, increase your hunting locations and multiply your harvest.

In the fall and winter, Ian Privette is a hunting guide in southeastern North Carolina. In the summer, he guides for trout in Montana.



TO GLOVE OR NOT TO GLOVE

Written by Megan Kirchgessner DVM, PhD

This article is reprinted from the summer 2013 issue of Fair Chase *magazine, a publication of the Boone and Crockett Club.*

Do you wear gloves when you field dress a deer? Almost every hunter admits knowing that he or she should be wearing them, but fewer actually are. It's pretty similar to skipping the salt at dinner, running those five miles after work or picking up the carrot sticks instead of the gummy bears for a road trip. It should be happening, but it's probably not. While a few extra pounds on the scale or a cholesterol level that's just a touch too high may only incite a mild response from your doctor or significant other, not wearing gloves while field dressing has the potential to raise more than just an eyebrow.

ELDADCARIN/123 RF STOCK PHOTO

Who Should Wear Gloves, and When?

The short answer is, anybody who handles dead wildlife should wear gloves. Always.

Contrary to popular belief, many diseases that affect game species are capable of infecting humans as well. Approximately 69 percent of human viruses, bacteria and parasites (collectively known as pathogens) are capable of causing disease in animals. In addition, 73 percent of pathogens that were diagnosed for the first time in humans within the last 20 years are capable of infecting at least one wildlife species. In other words, many pathogens that have a wide range of hosts can easily be transmitted from animals to humans and vice versa. What must be done to prevent transmission of these bugs from a dead animal to the human who is dressing it? It's not complicated or expensive, and does not require extensive planning or preparation. No, it's really rather simple. Wear gloves!

For a wildlife veterinarian like me, it's not a stretch to prefer to wear gloves when working with wildlife. I simply know too much about potential risks to do otherwise. But for people who have hunted for years without ever thinking about disease risks, to glove up when field dressing can be a radical decision. Every day I work with biologists who would never venture into the field without multiple pairs of gloves in their sample kit. Yet more often than not, they would not even consider putting gloves on after killing a deer on a Saturday morning hunt. In reality, there is no difference between the road-killed buck that needs to be sampled for chronic wasting disease and the doe that is killed at a deer camp on a Saturday; they both represent potential risks to human health if proper precautions are not taken.

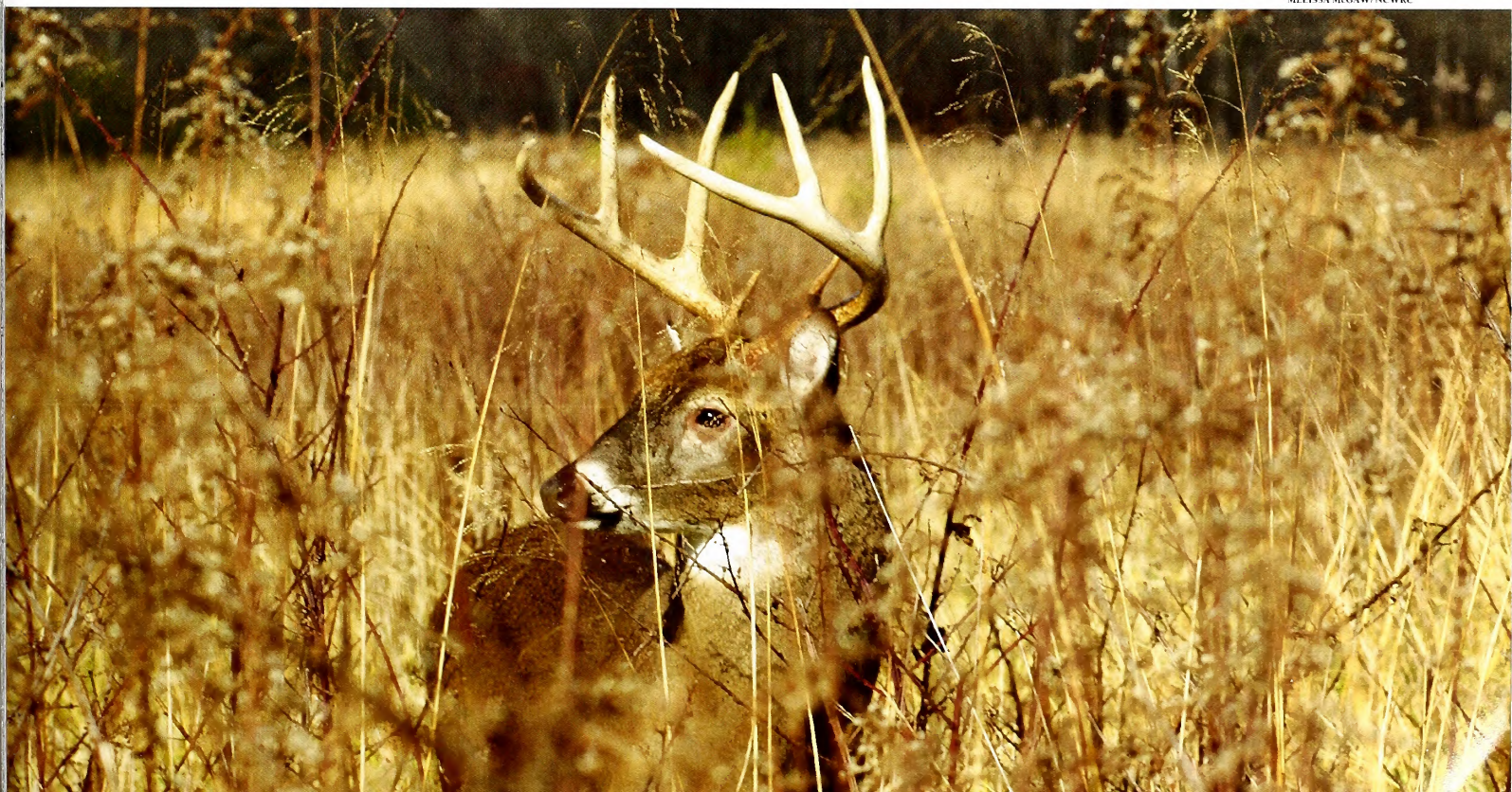
You may be aware of hunting-related disease risks but assume they occur somewhere else, not in the area your family has hunted for generations. Unfortunately, this is not a good assumption. Human sprawl, altered habitats, escape of captive-bred animals into the wild and shifting ranges of wildlife species have changed the distribution of pathogens and turned a new chapter on the transmission of diseases between humans and wildlife.

When it comes to transmissible diseases, ignorance is not bliss. There are many nasty pathogens that can easily be transferred from dead wildlife to humans who have not taken precautionary measures. Picking up an infection can ruin more than the remainder of your hunting season. Let's look at some examples.

Tuberculosis and Tularemia

Mycobacterium bovis, also known as bovine tuberculosis, is capable of infecting a variety of hosts including cattle, deer and humans, and has been documented in various regions of the world. Depending on the locale, the main "reservoir" of the bacterium shifts from the European badger in England to the common brushtail possum in New Zealand to the white-tailed deer in northern Michigan. *Mycobacterium bovis* was diagnosed in a wild white-tailed deer for the first time in northern Michigan in 1994 and has consistently been diagnosed in deer harvested in the same region ever since. Historically, human *M. bovis* infections in the United States have been associated with the consumption of unpasteurized milk and other dairy products. But in the nearly 20 years since *M. bovis* was found in the wild white-tailed deer population of northern Michigan, deer harvested in that area pose a risk to hunters, processors and consumers of venison. During that time at least two Michigan residents have been diagnosed

MELISSA McGAW/NCWRC



Gloves not only prevent direct contact with infective fluids or tissues, they also decrease the likelihood of picking up ticks during skinning.

with *M. bovis*, suspected to be contracted via direct or indirect contact with an infected dead deer. One of these individuals punctured his left index finger with a hunting knife while field dressing a deer. Opening the chest cavity, he noted the presence of tan nodules that laboratory testing subsequently confirmed as bovine tuberculosis abscesses.

Tularemia, also known as rabbit fever, is a highly infectious, widespread bacterial disease typically transmitted from wild rodents or rabbits to humans. Mule deer have also been found to harbor the bacteria, albeit uncommonly. *Tularemia* has been diagnosed throughout the Northern Hemisphere, and humans most commonly become infected with *Fracisella tularensis*, the inciting bacteria, via skinning, eating or simply handling infected animals. Common routes of infection in humans include skin, eye or mouth contact with the blood or tissues of infected animals. Inhalation of infected dust or airborne particles may cause infection as well. Furthermore, any tick feeding on the infected animal may carry the bacterium and subsequently infect the hunter or trapper who skins or handles the host animal's carcass. Gloves not only prevent direct contact with infective fluids or tissues, they also decrease the likelihood of picking up ticks during skinning. Infections caused by direct skin contact (usually on the hand) with infected tissues or a tick may manifest as a slow-growing ulcer with associated enlarged local lymph nodes. Pneumonia-like illness may follow inhalation exposure. Untreated *tularemia* is fatal in up to 60 percent of human cases but drops to less than 5 percent in treated cases.

MELISSA McGAW/NCWRC

DAVID COBB/NCWRC

Both birds and mammals can carry diseases that can affect humans. The basic rule is always wear protective gloves when handling dead wildlife.

Q Fever

Q fever is a lesser-known bacterial infection that usually causes flu-like symptoms in humans. Occasionally, infected humans may exhibit more serious symptoms associated with lung, liver and brain infections. While the most notable sources of infection for humans are domestic sheep, goats and cattle, many species of wildlife, including white-tailed deer, are also believed to be potential sources of the bacterium. The causative bug, *Coxiella burnetii*, has been isolated from the blood, lungs, spleen and liver of infected animals during the early stage of the infection. The bacterium is usually harbored in the mammary glands during the later phase of the disease. This means that a splash of blood or milk from an infected animal into an open cut on the hand or arm of the human handler can lead to the successful transfer of the bacterium from the hunted to the hunter.

Because early Q fever is often mild and does not necessitate medical treatment, many infections likely go undiagnosed and thus untreated. The later form of Q fever, known as chronic Q fever, typically develops months to years after the initial infection and occurs when an early infection is not diagnosed or treated. Individuals with underlying heart problems are the most commonly affected, and the estimated mortality rate ranges from 2 percent to 65 percent. Because of the variable clinical presentations of Q fever and the fact that many people do not seek medical care when initially infected, the number of humans infected with the bacterium is not known.

How common is Q fever exposure in wildlife? Due to the scarcity of reported studies, it remains a mystery for most species and regions. The host range for *C. burnetii* is wide and includes a variety of species of mammals, birds and even reptiles, and the bacterium has been identified worldwide. In New York State, where antibody prevalence in the white-tailed deer population has been investigated, 17.6 percent of sampled bucks and 11.2 percent of sampled does had antibodies to *C. burnetii*, indicating exposure to the bacterium at some point during their lives. The antibody-positive deer were distributed widely across New York, suggesting that exposed animals were not clustered in particular locales. Bucks were more likely than does to be antibody-positive, and deer harvested in towns with greater than 10 cattle herds were more likely to be antibody-positive.

Such data show that you never know what pathogen or pathogens an animal may have encountered. Always remember this: it is safer to assume wildlife has been exposed to something rather than hope it hasn't.

Brucellosis

Another disease with serious potential implications for hunters worldwide is Brucellosis. *Brucella abortus*, a bacterium, is commonly diagnosed in elk residing in the Greater Yellowstone Basin. Brucellosis is known as undulant fever in humans and typically causes waves of feverish episodes, often accompanied by profuse sweating, muscle pain and delirium. Years ago, when bare-armed rectal examinations were commonplace in large animal veterinary practice, it was not unusual for

veterinarians to become infected as a result of direct contact with the bacterium while performing rectal palpations in cattle. Now, I am fairly certain that most hunters asked to perform a rectal examination of their quarry would elect to glove up. Considering all these bugs that seem to be waiting for their chance to infect a human, do you think gloves should be reserved for the "dirty" end of the animal only? Let's be honest. Viruses, parasites and bacteria don't just collect in the rectum of any dead animal. They're everywhere! By the way, rectal sleeves extend all the way to the shoulder, making them great for safe field dressing and keeping the sleeves of your favorite hunting shirt clean and ready for next weekend.

Better Safe Than Sorry

If you remember one thing from this article, it's that the easiest way to prevent transmission of pathogens from wildlife to humans is to wear gloves when handling carcasses. A physical barrier between human skin and animal flesh prevents the potential contact of animal bodily fluids with entry points in the skin, such as open cuts or abrasions. Should you become ill shortly after exposure to wildlife, regardless of whether or not you wore gloves when field dressing, it is critical that you inform your doctor of recent contact with a wildlife carcass. Most doctors don't diagnose many of the pathogens that could potentially be transferred from wildlife to humans, so these illnesses are unlikely to make the list of potential diagnoses if you don't inform them about that possibility. To avoid possible multiple trips to the doctor's office and the prescription of ineffective treatments, it is best to be upfront and let the doctor know what you may have been exposed to.

Finally, it is always easier to form good habits than to break bad ones, so it is critical that the next generation of hunters understand at an early age that gloves are just a normal and accepted part of field dressing. If setting a good example for the next generation of hunters is what is needed to make you start packing latex gloves, I'll take it. If you start throwing on a pair of gloves because you've decided TB or any of the fevers (rabbit, undulant or Q) aren't things you're interested in getting to know first-hand, I'll take that too.

Like wildlife, people need to adapt to changes in their environment and relationships to other organisms. For hunters, using caution in the face of emerging diseases is one aspect of "survival of the fittest."

Megan Kirchgessner is the State Wildlife Veterinarian for the Virginia Department of Game and Inland Fisheries. She recently completed her Ph. D, entitled "Spatial Epidemiology of Bovine Viral Diarrhea Virus and Coxiella burnetii *Seroprevalence in White-Tailed Deer in New York," where she studied diseased transmission between humans and animals.*

Commission Takes New Step With Wildlife Diseases

MELISSA McGAW/NCWRC

Dr. Maria Palamar

Just a few months ago, the N.C. Wildlife Resources Commission took the innovative step of hiring its own wildlife veterinarian, Dr. Maria Palamar. The commission is one of only a handful of similar state agencies to include a wildlife vet on its staff.

The reason for the hire, said Dr. David Cobb, chief of the Division of Wildlife Management, was one of necessity. "The range and importance of wildlife disease issues is broadening," Cobb said. "Ranging from long-standing diseases such as rabies, to more recent issues with white-nose syndrome in bats, to efforts to prevent the spread into North Carolina of Chronic Wasting Disease in cervids, disease-wildlife-human issues are increasing in scope and complexity.

"These issues are important to the management of our state's wildlife resources and therefore to our citizens. Wildlife veterinarians bring expertise not typically available in traditional wildlife biologists, thereby increasing our ability to soundly manage our important wildlife resources to meet the desires of all of our citizens."

Palamar, an Argentina native who has a degree in veterinary medicine and a Ph.D. in fisheries, wildlife and conservation management, agreed with Cobb's view, adding that she believes it is the interactions among many different professionals and disciplines that can be most helpful. "It's good to have a group working together with different backgrounds — veterinarians, biologists, technicians, human dimension specialists. It brings a lot to the table. You never know who's going to have a great idea."

Palamar's view of wildlife disease is not one based on individual animals, but on populations of animals. It is more of an ecosystem approach to veterinary medicine. "Having someone who knows how disease moves in a population, how they are transmitted between animals or how some pathogenic agents can stay in habitat for very long periods of time is important," she said. "Bringing in someone that has that type of knowledge was very forward thinking for our agency.

"Wildlife is being affected by a lot of pressures. They're losing habitat, we have exotic species coming in and competing for resources, climate change. Many things are happening. One of the ways our wildlife populations are expressing this is through disease. Although the diseases might not be important from a human health point of view, they are for the wildlife population. As an example, when CWD started in Colorado, they didn't know what was going to happen. Now they have whole populations of deer that are declining so fast they might become extinct. Not the species, but that specific population is not going to be there."

Jim Wilson

LOWCOUNTRY BOIL

One-*Pot* Seafood Dishes

Written by Keith Hobbs
Photographed by Melissa McGaw

Toward the end of Robert Ruark's "The Old Man and the Boy," the outdoors classic set in Southport and written by one of North Carolina's best known authors, a chapter deals, among other things, with a recipe for terrapin stew. The Old Man was "elucidating" to the Boy, as he was prone to do—this time about cooking.

"Things," the Old Man said, "certainly ain't like they used to be. It's the penalty we pay for getting wise. About the time a man decides what he likes or don't like, either he can't find it, can't afford it or can't handle it. I can sum it up with the diamondback terrapin." After a bit more imparting of wisdom to the boy on various topics, he finally got around to answering the boy's question of "How do you cook the terrapins?"

"There was lots of ways but I still like the Maryland way best," he said. "Saying you got two mature terrapins—and can afford them—you would get a pint, more or less, of meat. You pop in a pound of butter and a couple pints of Jersey cream, throw in a big slug of sherry and some seasoning, bring her to a boil—and son, that is a stew that makes my gouty foot hurt just to think about it."

(Diamondback terrapins are state and federally listed as a species of special concern and may not be possessed these days without a permit in North Carolina.)

The Boy's question about how to cook the terrapins and the Old Man's answer of a pint of meat "more or less," a "big slug" of sherry, and "some" seasoning, sets the tone for these thoughts on preparing stews, chowders, soup, boils and such. There are basic ingredients that you just have to have in all recipes. But there's probably not too much you could leave out or add to the ones that follow that would mess up the final result to the point that the dishes would go to waste. This mix of seafood recipes, for the most

OYSTER FRITTERS

"Whatever you call it or however you spell it, for an easy one-pot meal, a Lowcountry boil is hard to beat."

part, is all of the "one-pot" variety. You'll use a few other dishes along the way, but the final product will wind up in one pot or dish. Most are pretty simple and quick to prepare once you have the ingredients, spices and incidentals within reach.

Oyster Fritters For a Warm-Up

Just for starters, here's a quick and easy oyster fritter recipe for something to snack on while the other dishes are coming along. Simply cut up a cup of oysters and beat an egg, get "some" flour as the Old Man would say, and salt and pepper.

Mix together the chopped oysters, beaten egg and seasonings (adding a little minced onion and black pepper if you prefer). Add just enough flour to hold everything together. Drop by spoonfuls into hot grease and fry until golden. (From Eloise Pigott in a long-ago issue of *Coastwatch* magazine.)

A One-Pot Classic: the Lowcountry Boil

This dish has many names and spellings. According to Wikipedia, a social gathering in South Carolina that revolves around shellfish and involves shrimp, corn on the cob, sausage and red potatoes may go by different names but is generally considered Lowcountry cuisine. A dish of this type may be called Frogmore stew, Beaufort stew, a Beaufort boil, a Lowcountry (or Low Country) boil, or a Tidewater boil. Whatever the name (and however you spell it), according to Wikipedia, the South Carolina version tends to be milder than the dishes favored by their Louisiana Cajun and Creole cousins in that large quantities of cayenne pepper and hot sauces are not necessarily part of the recipe.

Whatever you call it or however you spell it, for an easy one-pot meal, a Lowcountry boil is hard to beat. It's simple to prepare and there's something in there that most everyone will like. If the basic recipe isn't quite sexy enough, add something else. If you can get crayfish or "mudbugs" to add to the shrimp, they make a colorful and tasty addition to the pot and are enough of a rarity in these parts to create extra interest. Crab legs, blue crabs or clams are other choices that add both taste and visual appeal.

A nice thing about a Lowcountry boil is that even though it's usually made for a crowd, it doesn't really have to be. By simply scaling back the ingredients to the size of the cooking pot, you can easily have a nice little boil for as few as two.

But for the traditional outside boil, a propane ring, a large, deep pot, and a strainer basket for easier serving is basic. A 30-quart turkey-frying rig will do nicely.

You can also prepare this on an open fire. A good bed of coals and a sturdy grate to hold the pot can do the job. Just be sure you've got plenty of heat since the pot should be kept at a rolling boil during as much of the cooking process as possible. Bring the pot back to a boil quickly after adding each ingredient.

The basic ingredients usually include small red or "new" potatoes (two or three per person cooked whole or halved if large); smoked sausage with Louisiana-style andouille or Polish kielbasa or both being the traditional choices (a quarter-pound per person cut in chunks); yellow corn (one or two ears per person broken into smaller pieces); shrimp headed in the shell or just like they swim (about one half- pound per person); crayfish (six or eight per person); blue or snow crabs (quantity depending on size). You many use bagged spices (such as Zatarain's or Old Savannah Crab & Shrimp Boil) or loose spices of your choice (wrapped in cheesecloth if you don't want them to mix with everything, although some folks swear by loose spices sticking to the food). Start with enough water to cover everything you're planning to add. Pour in a dark beer or two for flavor if you like. We added a few cut-up lemons, whole garlic cloves, and peeled onions to punch up the broth as well as a heavy dash of cayenne pepper and a few bay leaves. Salt is optional as is butter.

That's a basic setup. One of the attractions of this dish, like those that follow, is that you can pretty much add whatever else you like if you just take cooking times into

Clam/Corn Chowder

1 pint clams (fresh or canned)
¼ cup chopped bacon
1 cup chopped onion
1 cup clam liquor and water
1 cup diced potatoes
1 teaspoon celery salt
1 teaspoon salt
1 cup cooked whole kernel corn (fresh, frozen or canned)
2 cups milk (half & half if you prefer a richer taste)
1 tablespoon butter
¼ cup cracker crumbs

Drain and chop clams saving the liquor. Fry bacon until crisp and drain on absorbent paper, setting aside most of the bacon but reserving a little for a garnish. Sauté onion in bacon drippings until tender. Add clam liquor and water, potatoes, seasonings and clams. Cook for about 15 minutes or until potatoes are tender. Add corn, milk, bacon and butter and heat. Stir in cracker crumbs if you want to thicken the chowder. Garnish with the remaining bacon sprinkled over the top.

ONE-POT SHRIMP STEAMER

"Have plenty of sturdy paper towels; folks handling corn on the cob, peeling shrimp, and generally getting in up to their elbows will require a little cleaning up."

consideration. Individual tastes and what's on hand reign with this dish.

Your pot and lift-out basket has to be large enough and deep enough to keep all ingredients covered while cooking. And keep the pot covered when not adding ingredients.

Bring your base liquid and spices to a boil for a few minutes to meld the flavors. When it's time to add the ingredients let your taste and preferences dictate the process and timing, but mushy potatoes and soggy corn are bad news. Overcooking is worse than al dente so pay close attention to your times and you'll get a better result. Potatoes first. Boil for about 10 minutes or less. Add the corn and meat and cook for three minutes or so. Shrimp and/or crayfish go in last and no longer than three to five minutes should be fine. Again, don't overcook and don't stir much if at all. Everything just needs to be covered by the boiling liquid. You won't go wrong by just letting the layers cook where they land in the pot.

Remove the basket from the pot and drain. Some like to separate all the ingredients into different containers but most simply dump everything onto a table spread with newspapers and let the diners fill their plates. Get everything out of the liquid immediately when it's done to your satisfaction. The corn particularly, along with other ingredients, will get soggy in a hurry if left soaking even for a short time.

Serve with side dishes of your choice. Have plenty of sturdy paper towels; folks handling corn on the cob, peeling shrimp, and generally getting in up to their elbows will require a little cleaning up.

From the Lowcountry to New England

If you want to offer a similar dish but would rather go with something not quite so spicy, move from the Lowcountry up the coast to a New England boil. This recipe works best with large oily fish that are scaled and steaked. Leave the skin on to hold the fish together as it cooks.

Start with two to three potatoes and one or two onions (depending on size) along with a half to a pound of fish steaks per person. Some add carrot and celery stalks with the onions as well. Add salt or salt pork to taste and water to cover.

The cooking setup is the same as earlier. Scrub or peel potatoes and peel onions. Add potatoes to boiling water and cook for five to 10 minutes. Add onions and cook for another five to 10 minutes. Add fish and cook "til the potatoes stick done" and the fish flakes with a fork. Bread, butter, lemon wedges, slaw or salad and fresh vegetables in season make this a tasty and attractive dish.

You can't go wrong by providing Old Bay Seasoning with both these boils for those who want to add extra kick. Captain Jerry Dilsaver, a well-known coastal sage, in a cooking column from long ago mentioned that his wife donna (sic) said he could eat the stuff on ice cream. That may be a stretch for most folks, but as a seasoning after the boil is on the table or on a side dish of steamed vegetables, it's always well received. You'll also see it as one of the seasonings in the boil liquid itself—about a cup of Old Bay to six quarts of water. Some use only Old Bay while others mix it with the bagged or loose spices. Again, it's an individual thing.

Clams, Crabs and Shrimp

Clams, oysters, shrimp, soft crabs, hard crabs, scallops; if you're yearning for a shellfish dish, the North Carolina coast offers these favorites in abundance. You might even pick up a conch now and then for variety in your dishes.

Whether you gather your own or buy them from the market, the options for shellfish preparation fill cookbooks. From simply steaming or boiling shrimp or opening fresh oysters and slurping them down, to preparing the most complicated sauces and casseroles, shellfish offer cooks endless opportunities. Here are some reasonably simple one-pot dishes, two of which can be prepared ahead and, to me, get better each time they are heated up again, plus one quick steamer choice with a sauce that really picks up the whole dish. ◆

Raleigh writer Keith Hobbs is a veteran angler, hunter and cook.

She-Crab Soup

1 pound crab meat (lump, claw, back fin or mixed depending on your taste and budget)
6 tablespoons butter
3 tablespoons flour
2 cups light cream
2 cups milk
1 teaspoon Worcestershire sauce
¼ teaspoon salt
¼ teaspoon grated lemon peel
¼ teaspoon mace
¼ teaspoon freshly ground white pepper
Yokes of 4 hard-boiled eggs
2 tablespoons dry sherry
Paprika

In top of double boiler, melt margarine. Blend in flour. Stirring constantly, add cream and milk, then Worcestershire, salt, lemon peel, mace and pepper. Add crabmeat and cook slowly for 20 minutes. Do not allow to boil or even to simmer. Remove from heat. Sprinkle crumbled egg yolks in bottom of individual soup bowls. Stir sherry into soup. Pour into bowls and then sprinkle with paprika. (From *Carolina STYLE* magazine)

One-Pot Shrimp Steamer

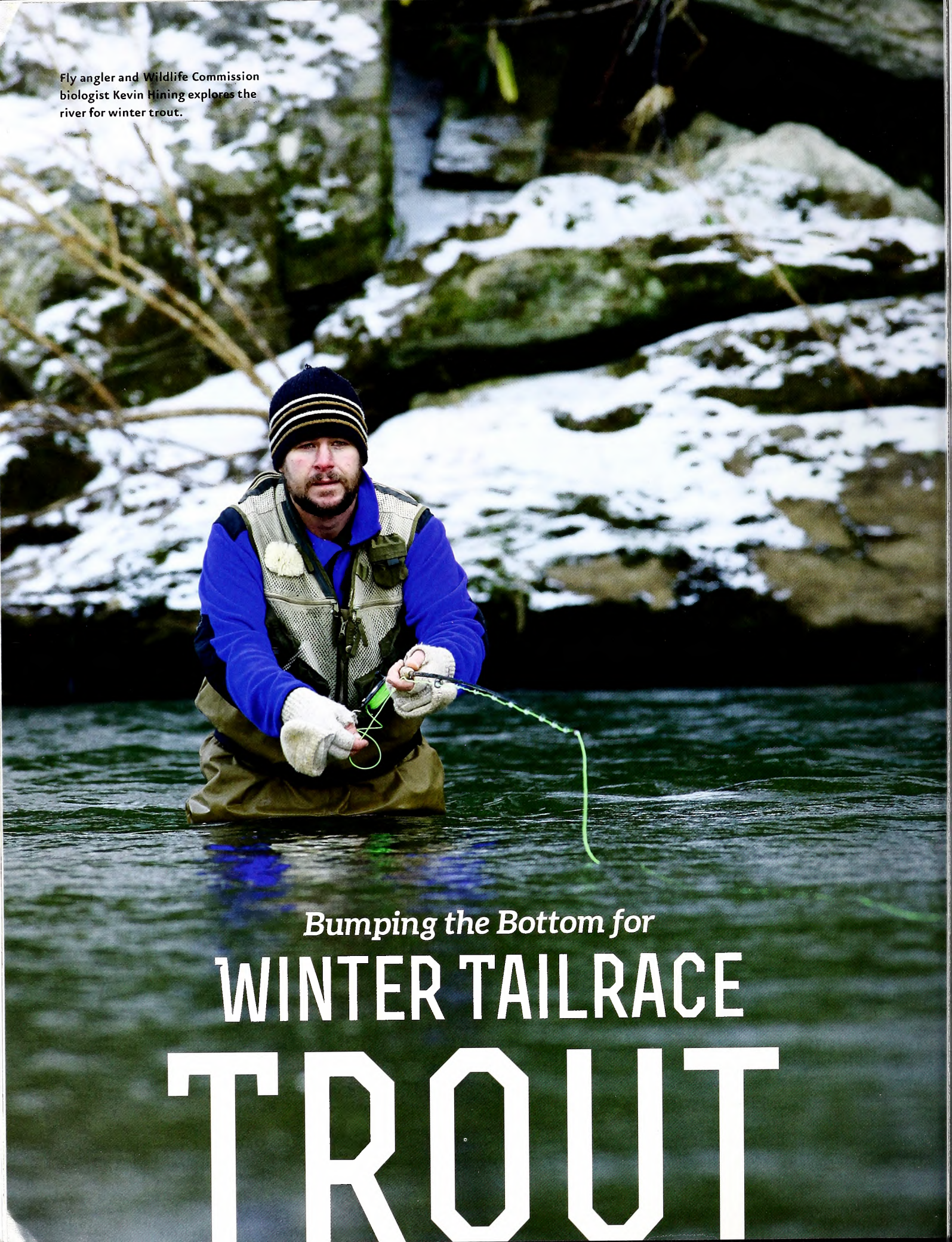
¼ cup soy sauce
¼ cup rice vinegar
¼ cup water
3 tablespoons sugar
1 clove garlic, minced
1 teaspoon lemon juice
½ teaspoon sesame oil
2 tablespoons slivered green onion, divided
2 tablespoons slivered fresh ginger root, divided
Dash Asian Chile sauce (see Notes)
6 shiitake mushrooms or large button mushrooms
½ head bok choy, cut crosswise into 1-inch slices
2 cups Chinese pea pods
8 jumbo shrimp, peeled and deveined

In a bowl, stir together soy sauce, rice vinegar, water, sugar, garlic, lemon juice, sesame oil and a tablespoon each of the green onion and ginger. Stir in Chile sauce to taste. Set aside.

Bring water to boil in the bottom of a two-quart saucepan with a steamer insert set over, but not touching, the water. Arrange the mushrooms in the steamer, topside down. Place the bok choy over them and top with remaining tablespoon of ginger and green onion. Cover and steam over medium-high heat for five minutes.

Add the pea pods and shrimp. Cover and steam four to five minutes until the shrimp are pink and just firm and the pea pods are crisp yet tender. Divide between two plates and serve with some of the sauce. (From *The News & Observer*)

Notes: Asian Chile sauce is sold in the Asian aisle of well-stocked supermarkets.



Fly angler and Wildlife Commission biologist Kevin Hining explores the river for winter trout.

Bumping the Bottom for

WINTER TAILRACE TROUT

Effective techniques for fooling tailrace trout during the cold months

WRITTEN BY JEREMY GRADY

PHOTOGRAPHED BY MELISSA McGAW

The big game wouldn't start until 6:30 p.m., so I had several hours to kill before I was supposed to be at Dad's house. The temperature was about 38 degrees, and along with the passing clouds there were a few snow flurries. I thought, wouldn't it be cool to go trout fishing on Super Bowl Sunday? The stream would probably be deserted and if I caught just one trout, that would be icing on the cake. So I called for the wheel schedule report of the closest tailrace river and, just my luck, they were not generating. I hung up the phone, pulled on my waders and was out the door.

With the added layers of long underwear under the waders, the stream didn't feel too cold. I started casting a double nymph rig with an indicator to the edge or to any break in the current, hoping a hungry trout might be holding there. I followed each drift attentively as the indicator twitched along at the nymphs crawling across the bottom.

I continued casting and drifting until the indicator darted abruptly. The rod tip came up and I was into a fish. The fish stayed down in typical brown trout fashion and did a couple of short runs before coming to the net. I scooped up 13 inches of bronze, thick, tailrace brown trout that took the bottom fly. After releasing him, I continued fishing the long run and picked up several more on the nymphs. All of the trout were 12 inches or better with one brown trout that measured 18 inches. Not bad for a couple hours fishing and I arrived in plenty of time for the big game.

Most anglers wouldn't consider wading in an icy trout stream in the middle of winter in pursuit of catching a fish. The truth is, winter trout fishing is a wonderful cure for cabin fever. You don't have to wait until spring to catch trout. With the right techniques on the right streams, you can catch them during the cold months.

There are two types of streams in North Carolina that hold trout—freestone and tailrace. Freestone streams are the spring-fed, plunge-pool types that usually trickle down from some mountain to eventually form into creeks. Tailrace streams are usually larger and are created at the foot of a lake where a hydroelectric dam is present and the water is regulated according to power demands.

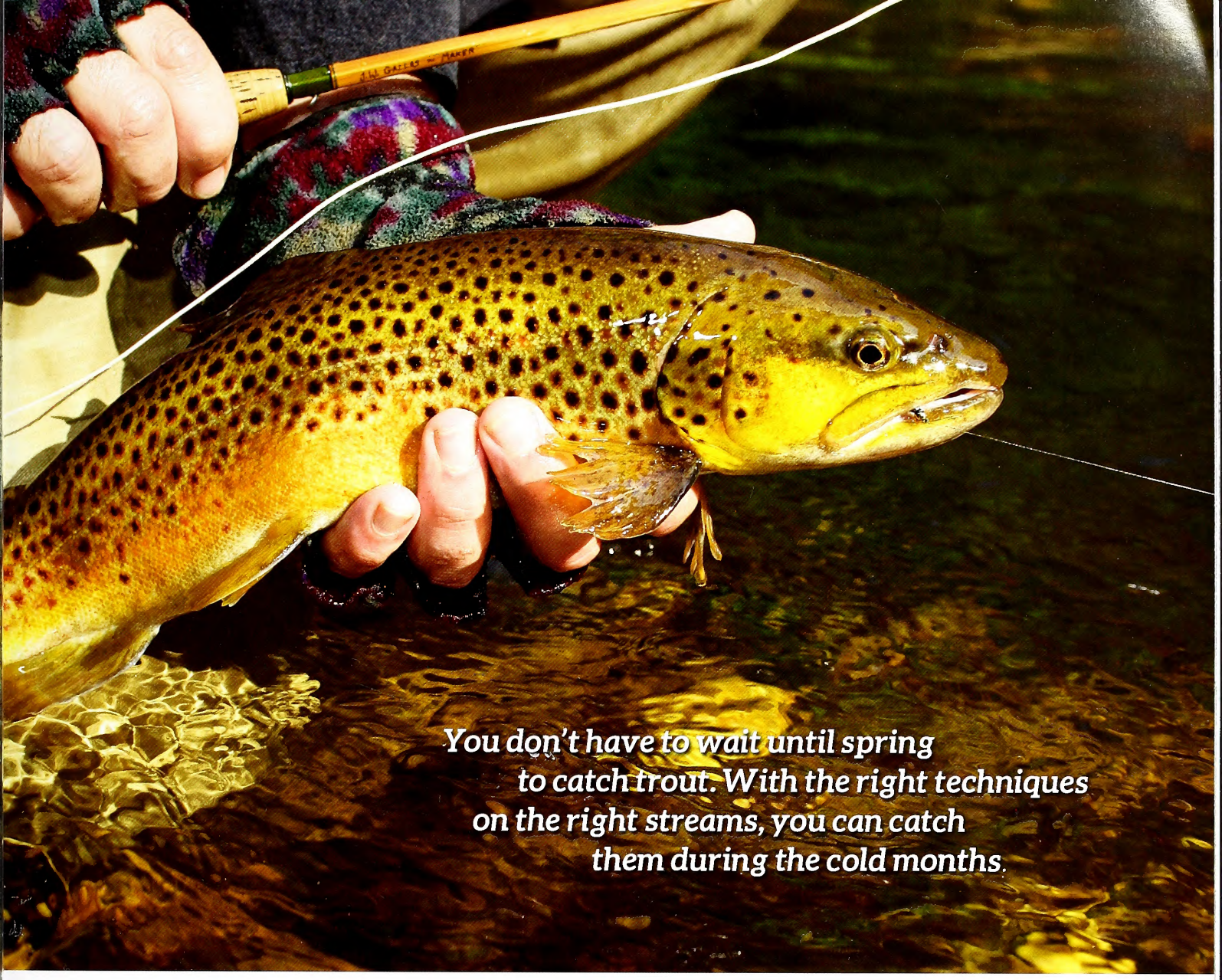
The key part of successful winter trout fishing is water temperature. The trout in the freestone stream this time of year are the same temperature as the water. Due to snow runoff and frigid nights, the water is about 33 to 35 degrees. The fish will probably be sluggish, hovering behind a rock while expending as little energy as possible and will be difficult to entice with a fly. The tailrace river is about 8 to 10 degrees warmer, allowing the trout to be more active and increasing your chance of a catch. Tailrace fish are usually larger due to increased food intake and can be choosy for the same reason.

All of my tailrace fishing starts with a phone call to find out what the projected wheel schedule is. That schedule can change. Sometimes due to power demands the generators may get turned on regardless of the wheel schedule, so it pays to know the places you can get in and out of. In the winter months, I only fish if the generators are off. A couple of hours of fishing are usually enough to take the edge off. If I fall in the river, the trip ends and I head for the warmth of home. There's no enjoyment in fishing cold, plus you're at risk for hypothermia. Sunny days may be a little more productive than others because just one or two degrees of warmth may cause insects and/or trout to be more active.

Pools are good choices to start looking for fish because the pool water is slower, so a fish can hold in them and eat while expending little energy. Sometimes, tailrace trout will congregate in pools, so fish pools thoroughly. I probe any kind of break in the current or edge. One warm January day several years ago, all of the trout I caught came out of one large pool. A shelf was under the water and the trout were a couple feet downstream, lying there and eating nymphs that tumbled overhead. When the day warmed up, some fish moved into water maybe a foot deep in the head of the pool. In addition to a few feisty 12-inch rainbows, a 17-inch brown trout also nailed a stonefly nymph, the best fish of the day. Sometimes if I don't get any takes, I move on upstream or "rest" and come back later.

Depending on where I'm positioned, I may downstream-drift the flies. I usually do this if there's a particular section of water that I can't reach. Sometimes, at the end of the drift, I'll twitch the indicator before picking up and casting again. On occasion, this happens by accident. One day while drifting downstream, I attempted to mend some line to extend the drift. In doing so the indicator twitched, immediately followed by a hard yank. Maybe the fish mistook the nymph for swimming or struggling because this was clearly out of the ordinary for dead drifting.

Riffles and runs are approached more methodically. As I wade to the nearest part of the riffle or run, I begin casting and drifting. Depending on the size of the water, I try to cover the entire section from head to tail. These sections are usually faster, so it may take a



You don't have to wait until spring to catch trout. With the right techniques on the right streams, you can catch them during the cold months.

couple of seconds for the flies to get down along the bottom. Many times I'll throw the fly into the head of the riffle and let it drift down below me. This allows time for the nymphs to reach maximum depth, causing the fly to remain in the strike zone longer. I may run the fly through the same exact drift a couple of times, especially if the drift has been known to hold fish. If I don't repeat the same exact drift, then my next cast is a couple of inches over, essentially paralleling the previous drift. I'll continue to do this until the entire section of water is covered.

One rule of thumb is to look for any kind of break in the current. Tailrace fish are notorious for holding in such places. To an angler, it may not look like much but under water, there may be a boulder or log altering the stream movement causing various breaks or a seam. A fish can hold in a seam and pluck bugs while spending very little energy.

A specific place that I'm thinking of has a boulder at the end of a run and a seam that's been created on each downstream side. One day last winter, I was working this spot and caught a 13-inch brown trout on the near-side seam. I drifted the nymphs through there again,

Tailrace trout, such as this brown, tend to be a bit larger than trout in freestone streams because of the increased availability of food. In winter, water in tailrace rivers might be 8 to 10 degrees warmer than that in a freestone, thus making trout more active.

Combinations can work well when fishing for tailrace trout. Try a small nymph, such as a Hare's Ear or Prince, as the lead fly. Tie on a 24-inch piece of tippet through the eye of nymph's hook and attach a larger nymph. Pictured (clockwise from left) are Yellow Stonefly, Bitch Creek, Tellico nymph and Prince nymph. Chris Wood (left), also a commission fisheries biologist, tries his luck with a nymph.

nothing. Then I drifted the flies through the far side seam, and bam! A 14-inch rainbow. This fish jumped a couple of times and I eventually netted and released him. I made a couple more drifts, nothing. Then I began to let the flies drift completely through the seam toward the tail. This time the indicator darted and continued to run away from me. The rod tip came up with a fish that was 15 inches. Every seam around the rock held a fish and on this day, I was able to catch one out of each seam. I've never done that before or since.

Any out-of-the-ordinary movement by the indicator gets a hook-set. It's as if the fish intercepts the fly during the drift. Most of the time, the fish opens its mouth and inhales the fly causing the indicator to stop. I set quickly, not allowing the fish a chance to reject the fly. Sometimes you hook the bottom. Usually a roll cast will unhook a nymph from the snag.

In addition to watching the indicator, look for any sort of flash or boil. When a trout takes a nymph, many times it will slightly turn to one side or the other. You may have a fish move out of its lie to inspect a fly; here you can also see a flash. Always make a mental note if you observe this so that you can come back later to exploit it.

My nymphing system involves two nymphs, an indicator and a small split shot. You don't have to use two nymphs; one will work just fine. I like fishing two nymphs, especially for tailrace trout because they usually have a lot of food items to pick from. I don't feel like I'm giving the fish a choice. Instead, I'm learning what they're feeding on and their location in the water column.

An 8½-foot rod matched with a 6-weight fly line turns the rig over just fine. The entire leader is about 8½ feet. The first 4 feet tapers from 25-pound stiff monofilament down to 8-pound stiff monofilament and here, I've threaded the indicator. I use the kind that has a small hole in it where you can break off a toothpick. Next, I tie on about 20 inches of 6-pound soft tippet and knot the first fly. In the eye of that first fly, I tie an additional 24 inches of 6-pound tippet and knot the second fly. In the middle of the two nymphs, pinch on a BB-size split shot. This allows about 3 feet from the bottom fly to the indicator and covers most of the waters I fish.

Usually the system is pre-tied on my rod so that no fishing time is wasted. It can be a bit cumbersome to cast, so I try to hold the back cast a split second longer, allowing the line to straighten out behind. But mostly, I fish a fairly short line. From the end of the rod tip to the end of the fly line, it's only about 20 feet. This allows better line control while drifting nymphs and better accuracy while casting.

I do like the nymphs to tickle bottom some, but they don't always have to be there to catch fish. Many times the flies will bump the bottom and you may get hung up, which is OK. If you're hanging up a lot, adjust the size of the split shot or tippet lengths. You may be drifting through water that's 4 or 5 feet deep and the nymphs are suspended in the water column. If a fish is there and he's hungry and sees a nice, fat, juicy stonefly nymph passing above, it may be hard for him to resist. With one flick of the tail, that bug is food.

As for nymph patterns to choose from, the old standbys still do the job. Gold-ribbed Hare's Ears in olive, natural or brown are good. Pheasant Tail nymphs are a staple in tailrace fishing. Any peacock-tied nymph such as Zug Bugs, Prince Nymphs and Tellicos are always tied on as one of my flies. Sizes 10 through 16 will do fine. I usually knot the smaller nymph as the top fly. The bigger nymph such as Kaufman Stones, Bitch Creeks or Golden Stones in sizes 8 through 12 will work for good bottom flies. Also, if you know of local patterns that are proven producers, by all means tie one on. The bigger flies help get the nymphs down. But sometimes, if the fish seem to really like one fly or the other, I'll use two of the same pattern. And yes, you can catch two fish at one time.

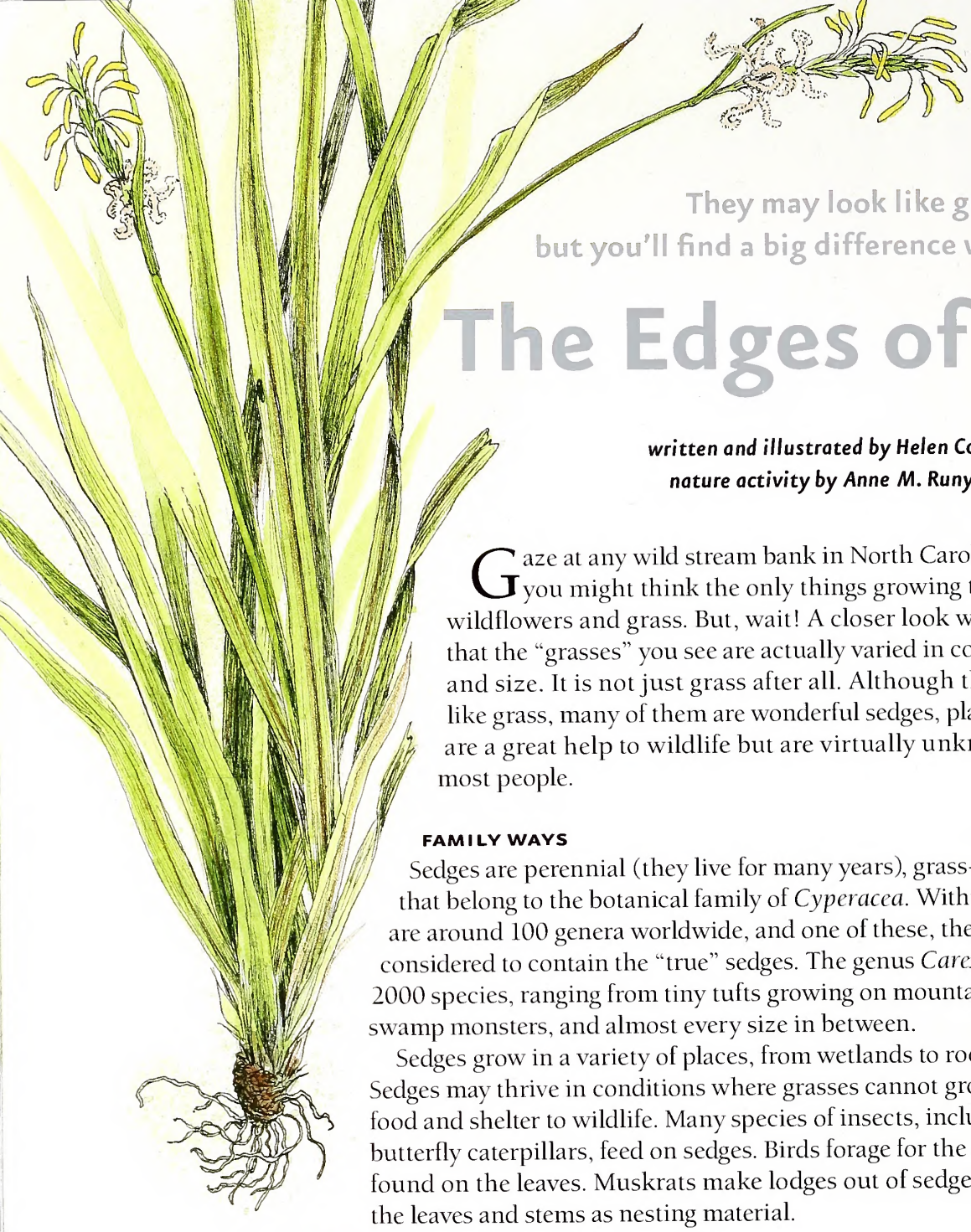
Bumping the bottom with nymphs during the cold months offers solitude and satisfaction. And you can start the season early while taking off the rust until spring. As for catching trout on Super Bowl Sunday? It doesn't get much better than that.

Jeremy Grady is a freelance writer from Morganton and a longtime contributor to Wildlife in North Carolina.

They may look like grass, but you'll find a big difference when you study

The Edges of Sedges

written and illustrated by Helen Correll
nature activity by Anne M. Runyon

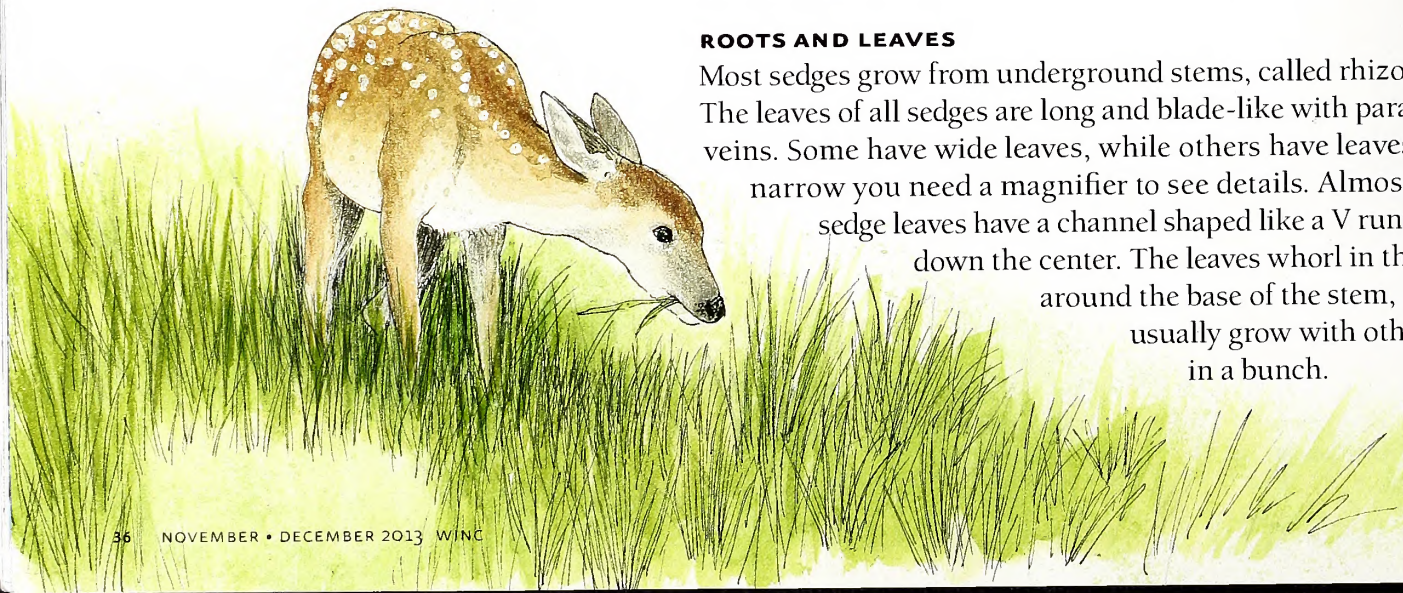


Gaze at any wild stream bank in North Carolina and you might think the only things growing there are wildflowers and grass. But, wait! A closer look will reveal that the "grasses" you see are actually varied in color, shape and size. It is not just grass after all. Although they look like grass, many of them are wonderful sedges, plants that are a great help to wildlife but are virtually unknown to most people.

FAMILY WAYS

Sedges are perennial (they live for many years), grass-like plants that belong to the botanical family of *Cyperacea*. Within the family are around 100 genera worldwide, and one of these, the genus *Carex*, is considered to contain the "true" sedges. The genus *Carex* contains close to 2000 species, ranging from tiny tufts growing on mountain balds, to giant swamp monsters, and almost every size in between.

Sedges grow in a variety of places, from wetlands to rocky rivers to dry woods. Sedges may thrive in conditions where grasses cannot grow, and in turn provide food and shelter to wildlife. Many species of insects, including several moth and butterfly caterpillars, feed on sedges. Birds forage for the seeds as well as insects found on the leaves. Muskrats make lodges out of sedges, and sedge wrens use the leaves and stems as nesting material.



ROOTS AND LEAVES

Most sedges grow from underground stems, called rhizomes. The leaves of all sedges are long and blade-like with parallel veins. Some have wide leaves, while others have leaves so narrow you need a magnifier to see details. Almost all sedge leaves have a channel shaped like a V running down the center. The leaves whorl in threes around the base of the stem, and usually grow with others in a bunch.

CULM AND GET IT!

Sedge flowers do not look like most people's idea of a flower. They are tiny, and grouped together on spikes at the top of flower stems, which are called *culms*. At the top of the culm, separate male and female flowers depend on the breeze for pollination. The female flowers mature into *achenes* (dry seeds) with a thin, scaly sac-like covering called a perigynium.

It is difficult even for botanists to identify a particular species of sedge by its flowers or its leaves. To accurately name one, you must study the tiny perigynium's shape, pattern of veins and number of hairs. But in general, you can easily identify a sedge by the triangular shape of its culm. Kneel beside a grassy tuft, grasp the flower stem and roll it between your fingers. The edges of the three sides of the triangular culm are very obvious.

MOUNTAIN-TOP

Covered with a mix of sedges, mountain oat grass and rock outcrops, grassy balds usually occur at elevations of over 5000 feet. Brownish sedge and Pennsylvania sedge are two important species that grow on grassy balds and in upland woods of North Carolina. Both grow in low clumps in dry, infertile and even shady locations. Pennsylvania sedge grows in patches so dense that tree and shrub growth is kept at bay. The patches help rare wildflowers, such as Gray's Lily, Blue Ridge goldenrod, and Dwarf Cinquefoil seeds find a foothold on the bald.

Seepage slopes and springheads in rich mountain woods are upland locations favored by Eastern Rough Sedge and Ribbed Sedge. Twisted Sedge grows in rocky streambeds in the mountains and piedmont.

THROUGHOUT N.C.

Many species of sedge grow throughout North Carolina, from upland forests to coastal freshwater marshes. Fox Sedge and Shallow Sedge grow in marshes, ditches and meadows. Cherokee Sedge, with dangling seed heads that look like wheat, is common in meadows along rivers and creeks. Fringed Sedge is large, growing 2 to 4 feet tall, with wide, arching leaves. It grows in fairly shaded areas, as well as open wet locations.

HABITAT HEAVEN

Even though some species grow in forests and mountaintops, sedges are most often associated with swamps, bogs and marshes. Sedges often grow together in wetlands along with grasses, rushes and ferns to form an ecological community. If an area is dominated by sedges, it is known as sedgelands.

One of the most important wetland sedges is the tussock sedge, which creates its own little islands that lift its leaves above the shallow water around it. Over time, as leaves die, the built-up mounds allow still water to collect in little pools, offering shelter for frogs, turtles, and salamanders, as well as places for dragonflies and mosquitos to lay eggs. The insects and amphibians provide food for small fish and wading birds such as herons and coots. Tussock sedge provides cover and protection for small critters and the raised tussocks offer nesting sites for ducks, geese and ground-nesting birds. The seeds are food for mallards, wood ducks, wild turkeys, squirrels and various song birds. White-tailed deer eat the leaves, and muskrats enjoy nibbling on the roots.

Tussock sedge spreads somewhat by seed, but mostly by rhizomes that grow away from the mother plant to sprout a new clump close by.

Get Outside

Next time you are out in nature with your friends or family, do the "touch test" on the triangular culms to figure out which of the grass-like plants are sedges. For help, say this rhyme to yourself:

Sedges have edges,
Rushes are round,
Grasses are hollow,
What have you found?

When you find one casually announce, "Oh look. These plants are sedges! I can tell by their edges."

Read and Find Out

- "Native Ferns, Moss and Grasses" by William Cullina, Houghton Mifflin, 2008.
- "Wildflowers and Plant Communities of the Southern Appalachian mountains and Piedmont" by Timothy P. Spira, University of North Carolina Press, 2011.

Find out more about Project WILD Workshops and literature at the Wildlife Commission's website at ncwildlife.org.

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MBIND

Three-Edged Sedge Stem Sculpture

Not many animals find sedges tasty, but some moths and butterflies seek out and lay their eggs on sedge leaves. Their caterpillars hatch and munch along the sedge edges with gusto. The Virginia Ctenucha moth is shown here.

1) Copy your design onto card stock.

2) Cut out along the thick black lines.

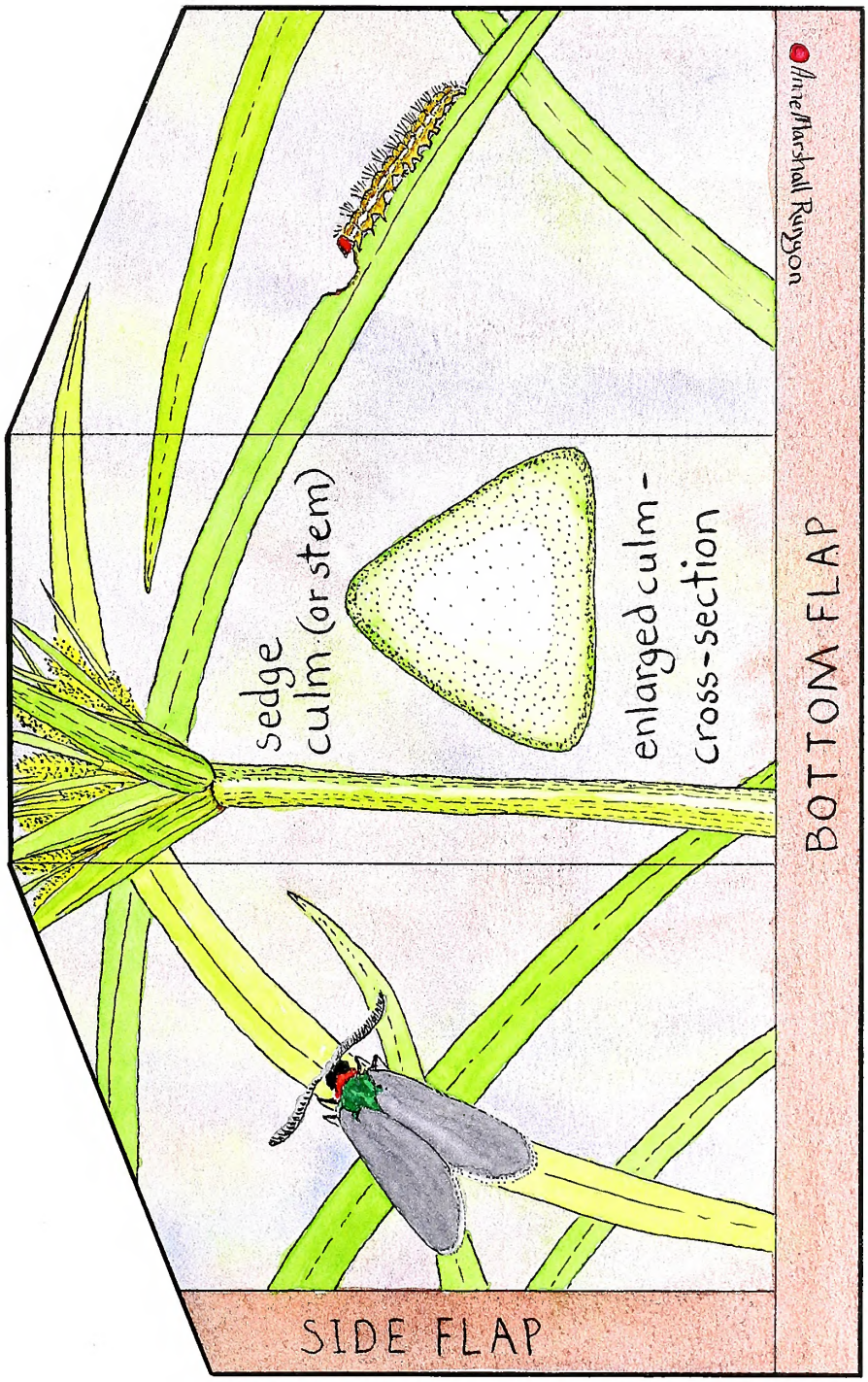
3) Fold the BOTTOM FLAP under first.

4) Then fold down along all the thin black lines, creating a triangular tube.

5) Tuck the SIDE FLAP into the BOTTOM FLAP and glue tube shut.

6) Your paper sedge culm sculpture can hold small sedge culms and flowers.

The culm is the stem of the sedge plant.



Wildlife Commission Presented with Waterfowl Conservation Award

MELISSA McGAW/NCWRC

MELISSA McGAW/NCWRC

Wildlife Commission Executive Director Gordon Myers accepts an award for outstanding wood duck trapping and banding from John Stanton of the U.S. Fish and Wildlife Service. (Left to right: Waterfowl Biologist Doug Howell, Stanton, Myers and Migratory Game Bird coordinator Joe Fuller.)

The N.C. Wildlife Resources Commission received an award in August from the U.S. Fish and Wildlife Service, Southeast Region, recognizing the commission for its outstanding work in waterfowl conservation and management in the Southeast.

John Stanton, a supervisory wildlife biologist with the service's Southeast Region, Division of Migratory Birds, presented the award to Wildlife Commission Executive Director Gordon Myers during the agency's business meeting in Raleigh on August 29th.

The commission's Migratory Bird Program received the award because of its outstanding efforts over the past several years trapping and banding wood ducks during the pre-season period, which usually begins in July and ends mid-September.

"The Wildlife Commission stands out among the states in the Atlantic Flyway for banding, on average, 1,600 wood ducks a year over the past three years," Stanton said. "In the last 10 years alone, the agency has banded over 11,000 wood ducks during the pre-season period, which is quite an accomplishment."

The Migratory Bird Program is led by Joe Fuller, the commission's migratory game bird coordinator, and Doug Howell, the commission's waterfowl biologist. Their trapping and banding efforts have contributed significantly to wood duck conservation and management in the Southeast, said Stanton.

"It goes without saying, your annual, pre-season wood duck banding accomplishments are critical to the conservation and management of wood ducks in the Atlantic Flyway," Stanton said.

The commission's active participation in the Atlantic Flyway Council's Migratory Game Bird Technical Section, especially its participation in the Wood Duck and other Dabblers Committee, resulted in the adoption of a new and improved harvest management strategy for wood ducks in the Atlantic Flyway, which stretches from the Arctic Circle down the Atlantic coast and Appalachian Mountains and into the Caribbean.

"It's really gratifying to receive this award for the Migratory Game Bird Program, which works very closely with federal partners, conservation partners, like Ducks Unlimited, and hunters to monitor, manage and conserve migratory game birds in North Carolina," Myers said at the meeting. "I would like to recognize the collective efforts of our outstanding professional staff for their contributions to the program."

For more information on waterfowl, visit ncwildlife.org/hunting.

e NEWSLETTER
Get N.C. Wildlife Update—news including season dates, bag limits, legislative updates and more—delivered to your Inbox from the N.C. Wildlife Resources Commission. Sign up at ncwildlife.org/enews.

New Wildlife Commissioners Installed

The N.C. Wildlife Resources Commission has installed 11 commissioners to the 19-member board which establishes policy and regulations governing statewide conservation efforts, as well as hunting, fishing and boating activities. Members serve until reappointed or replaced. Appointments are made by the Governor, the Speaker of the state House and the President Pro-Tem of the state Senate. Jim Cogdell presided over his first Wildlife Commission meeting in August as chairman.

MELISSA McGAW/NCWRC

Jim Cogdell

Gov. Pat McCrory made appointments for a district commissioner and at-large commissioners. Among those appointments was John Litton Clark, of Clinton, as commissioner for District 4, made up of Scotland, Hoke, Harnett, Robeson, Cumberland, Sampson, Bladen, Columbus and Brunswick counties.

McCrory also named John T. Coley IV of Holly Springs, and V. Ray Clifton of Clarkton to at-large appointments.

Speaker Thom Tillis named Richard Edwards of Wilmington, Tim Spear of Creswell, Thomas Fonville of Raleigh, and Michell Hicks of Cherokee, to at-large appointments.

Senate President Pro Tem Phil Berger named Tom Berry and Mark Craig, both of Greensboro, Dell Murphy of Wallace, and Garry Spence of Charlotte, to at-large appointments.

Habitat Foundation Donates Money

The N.C. Wildlife Resources Commission has received a donation from the N.C. Wildlife Habitat Foundation to improve angler access on the Reddies River in Wilkes County and to control invasive, non-native plants in the Wilson Creek watershed in Caldwell County.

NCWHF Executive Director Eddie Bridges presented an $8,000 check to Bob Curry, chief of the commission's Division of Inland Fisheries, at the commission's business meeting in Raleigh in August.

The commission, working with the Yadkin River Greenway Council, will use $3,000 of the donation to construct four sets of angler-access steps on a one-mile reach of the Reddies River, which is classified as Delayed Harvest Trout Waters. The reach, which extends from North Wilkesboro's water supply dam to the Yadkin River, is bordered by a paved walking trail that is part of the Yadkin River Greenway.

The steps will have a low profile, which should minimize damage from flooding and require only minor bank grading.

"Because these steps will concentrate angler access at several established points, erosion problems from anglers walking on the other sections of the river bank should be substantially reduced," Curry said. "Reducing the amount of sediment entering the river will improve water quality and habitat for trout."

The remaining $5,000 of the Habitat Foundation's donation will be dedicated to controlling invasive, non-native plants in the Wilson Creek watershed, with an emphasis on Japanese knotweed. Within the last 10 to 15 years, invasive plants, such as Japanese knotweed, coltsfoot, Japanese honeysuckle, kudzu and others, have become widespread.

"The Wildlife Commission is extremely appreciative of the good work that Eddie and the N.C. Wildlife Habitat Foundation have done over the years to enhance our state's beautiful natural resources," Curry said. "This latest donation, combined with state and federal money, will go a long way toward helping us improve habitat conditions and fishing access in two very popular angling destinations in western North Carolina."

For more information on fishing in North Carolina's public, inland waters, visit ncwildlife.org/fishing. For more information on the foundation go to ncwhf.org.

IN SEASON

In November and December, these seasons are open in North Carolina:

Black Bear: See *Regulations Digest* seasons and locations.

Bobcat: Through Feb. 28.

Brant: Dec. 23–Jan. 25.

Canada Goose and White-Fronted Geese: Resident Population Zone Nov. 10–Dec. 1; Southern James Bay Zone and Nov. 9–Dec. 31.

Common Snipe: Nov. 14–Feb. 28.

Crow: Through Feb. 28.

Ducks, Coot and Mergansers: Nov. 9–Nov.30 and Dec. 14–Jan. 25.

Feral Swine: No closed season.

Fox: Nov. 16–Jan. 1 and Jan. 4–Jan. 25. See *Regulations Digest* for seasons and locations.

Hatchery Supported Trout Waters: Through Feb. 28.

Light Geese (Snow, Blue and Ross'): Nov. 9– March 8.

Mourning Dove: Nov. 25–Nov. 30 and Dec. 13–Jan. 11.

Pheasant: Nov. 16–Feb. 1.

Quail: Nov. 23–Feb. 28.

Rabbit: Nov. 23–Feb. 28.

Raccoon and Opossum: Through Feb. 28.

Rails, Gallinule and Moorhen: Through Nov. 21.

Ruffed Grouse: Through Feb. 28.

Squirrel: Gray and red through Feb. 28; fox through Dec. 31 in selected counties.

Tundra Swan: Nov. 9–Jan. 31 (by permit only).

White-Tailed Deer: *Eastern:* Gun season through Jan. 1. *Central:* Muzzleloader season Nov. 2–Nov. 15; gun season Nov. 16–Jan. 1. *Northwestern:* Bow season through Nov. 8; muzzleloader season Nov. 9–Nov. 22; gun season Nov. 23–Jan. 1. *Western:* Bow season through Nov. 23; gun season Nov. 25–Dec. 14.

Woodcock: Dec. 12–Jan. 25.

Youth Waterfowl Days: Feb. 1 and Feb. 8.

There is no closed season or bag limit for feral swine, coyote, groundhog, striped skunk, nutria and armadillo. There is an open season for taking beaver with firearms or bow and arrow during any other open season for the taking of wild animals.

Check the latest *North Carolina Inland Fishing, Hunting and Trapping Regulations Digest* for bag limits and applicable maps or visit ncwildlife.org.

CALENDAR OF EVENTS

Saturday–Sunday, Dec. 7–8

Fly-fishermen and beer lovers will enjoy the 4th Annual Western North Carolina Fly Fishing Expo at the Western North Carolina Agricultural Center in Asheville. Exhibitors abound (free parking) and there will be a local microbrewery beer tasting Saturday afternoon. Go to wncflyfishingexpo.com for more information.

Saturday–Sunday, Dec. 7–8

The Core Sound Decoy Carvers Guild is dedicated to the preservation of the waterfowl carving heritage that runs deep through the history of the Core Sound area in North Carolina. The 26th Annual Core Sound Decoy Festival will be held at Harkers Island Elementary School.

The Core Sound Waterfowl Weekend is an annual celebration of heritage at the Core Sound Waterfowl Museum & Heritage Center. It allows the Harkers Island community to throw open their doors, welcoming everyone to experience the natural beauty and maritime history of the area. This event is held at Core Sound Waterfowl Museum. Art abounds on Harkers Island. Go to decoyguild.com and coresound.com for details.

Tuesday & Friday, Dec. 10 & 13

Fishing lures become holiday ornaments at the commission's two workshops at the Raleigh headquarters. Join the Centennial staff in celebrating the holiday by making lure ornaments for your decorating. Give your house a little angling theme with these unique handmade ornaments. Go to ncwildlife.org/Learning.aspx for more information and to register.

Readers should check with the contact listed before traveling to an event. Items for listing should be conservation-oriented and should be submitted at least four months in advance to mike.zlotnicki@ncwildlife.org, or call 919-707-0175.

Federal Grants Awarded to Commission

The N.C. Wildlife Resources Commission was awarded more than $554,000 in nationally competitive federal grants on Aug. 16 to fund two projects that will help the agency and its partners conserve aquatic species in the Pee Dee River, as well as identify key habitats across the state that could be vulnerable to environmental impacts.

NCWRC

Wildlife Commission Research Coordinator Ryan Heise prepares to release a robust redhorse back into the Pee Dee River.

The commission was one of 11 states to receive more than $5 million from the U.S. Fish and Wildlife Service through its competitive State Wildlife Grants (SWG) Program. All SWG-funded projects implement strategies and actions to conserve and recover priority species and habitats identified in the N.C. Wildlife Action Plan.

In North Carolina and South Carolina, a $460,000 grant will fund a collaborative effort between the Wildlife Commission, S.C. Department of Natural Resources, the N.C. Cooperative Fish & Wildlife Research Unit, and N.C. State University, that focuses on the robust redhorse — a large, very rare freshwater fish that is found in only three river drainages in the southeastern United States. The robust redhorse is a state listed endangered species, and is also a priority species as designated by the N.C. Wildlife Action Plan.

The grant, which will be matched with $225,400 in state funds, will be used to determine the effects that habitat and water quality changes have on the redhorse as well as other fishes, mussels and crayfish found in the Pee Dee River, which forms at the confluence of the Yadkin and Uwharrie rivers in Montgomery County and flows from North Carolina into South Carolina. The robust redhorse has been negatively affected by habitat modification and fragmentation from hydroelectric dams, introduction of non-native species, sedimentation and water pollution.

The second SWG-funded project, a $94,374 grant, will also have the commission working with the N.C. Cooperative Fish & Wildlife Research Unit (N.C. Coop Unit) to analyze and map key areas around the state that provide the best opportunities for conserving Wildlife Action Plan priority species and their habitats.

"The data will help us understand how various types of landscape-scale threats can impact wildlife habitats and species that are of conservation concern," said Cindy Carr, the commission's Wildlife Action Plan coordinator. "The information will allow us to develop conservation priorities and recommendations that we will incorporate into the revised N.C. Wildlife Action Plan, which will be released in 2015."

The Wildlife Commission and other conservation organizations currently use the N.C. Wildlife Action Plan released in 2005 as a blueprint to identify wildlife and habitat issues in the Tar Heel state and outline the actions that are needed to conserve species and habitats over many years.

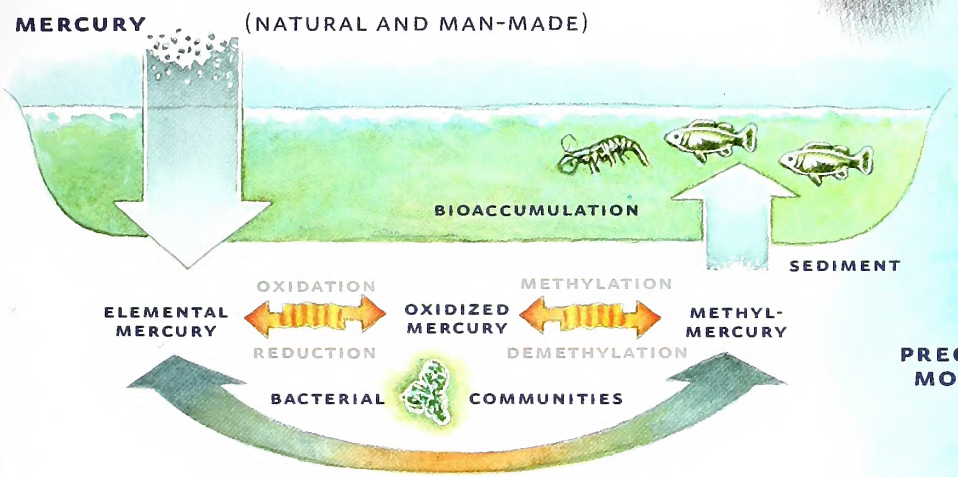
All 50 states and five U.S. territories developed State Wildlife Action Plans, which were required by the U.S. Fish and Wildlife Service for states to receive State Wildlife Grant funding.

What Makes Mercury So Dangerous?

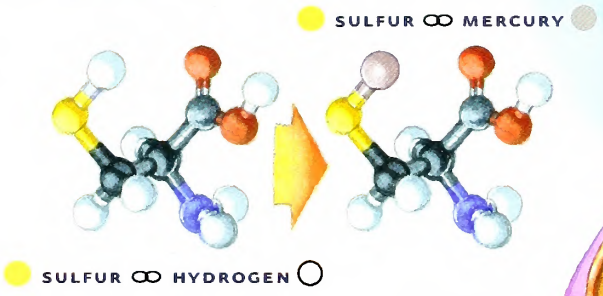
written by Clyde Sorenson
illustrated by Jim Brown

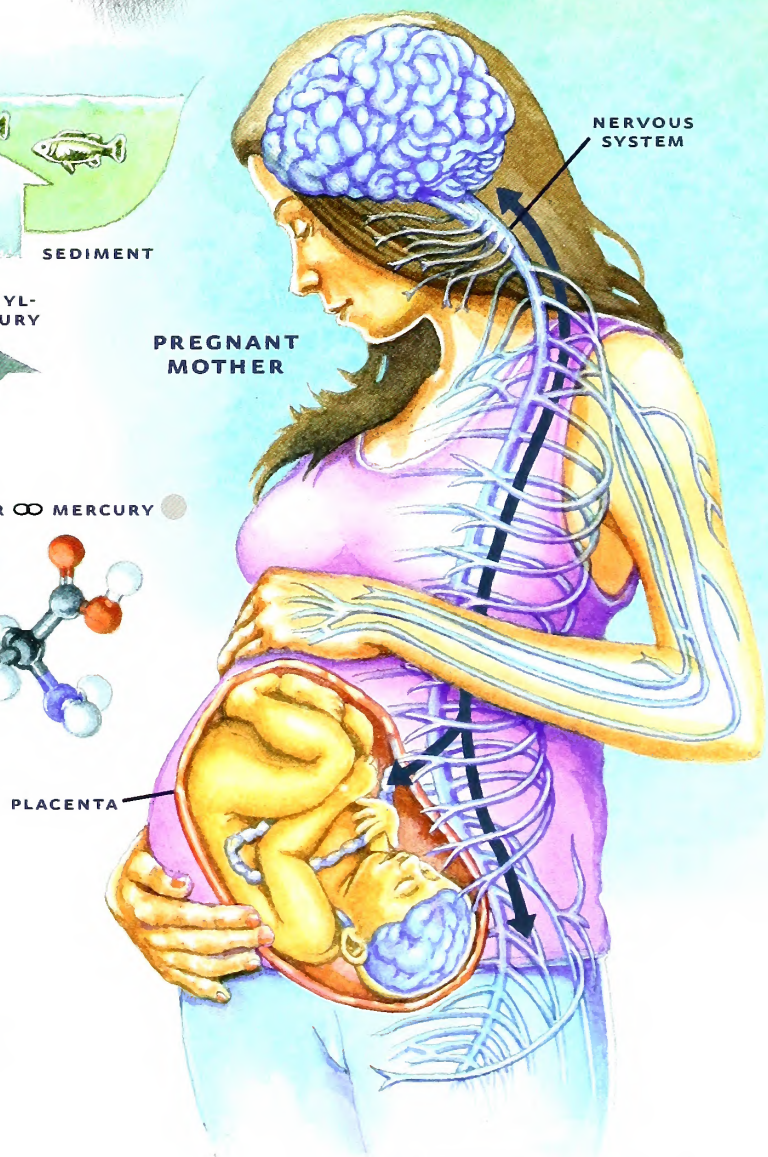
MERCURY, IN ITS ELEMENTAL FORM, is fascinating stuff—liquid metal that "rolls" in a remarkable way, but it is definitely nothing to play with. While different forms of mercury enter an animal's body in different ways, every form of mercury is toxic.

One of the most dangerous forms of mercury is methylmercury, which is produced by bacteria exposed to elemental mercury. Methylmercury is an organic compound absorbed by living things much more readily than elemental mercury and is the most common mercury exposure for most animals.



Mercury's ability to bind with and deactivate important enzymes that allow cells to repair themselves is one of the most important effects of the metal. Some of these enzymes contain the elements sulfur and selenium; mercury has a strong affinity for both.





While mercury in the form of methylmercury can have toxic effects on most of the cells in the body, the damaging effects on the nervous system are particularly serious, since the nervous system runs everything else. Intoxicated animals may have reduced coordination, muscle function, and mental function. Unfortunately, low level intoxication can have very subtle effects.

Perhaps the most pernicious effect of methylmercury is its effect on developing offspring. Methylmercury can cross the placenta of mammals — and damage to the rapidly developing nervous system of a fetus can be permanent.

Duck Hunter's Flambe'

written by Jim Dean

I sometimes wonder what it is about duck hunting that makes me feel like I'm a character in some cartoon adventure—a temporary Looney Tunes version of my otherwise mostly normal self. I'm pretty sure my hunting companions (my brother John and son Scott) share this disjuncted feeling. Things just seem to happen to us—bizarre, weird, yet occasionally even marvelous things. It's almost as though cosmic forces are messing with us purely for amusement.

JIM DEAN

It's not because we are clueless novices. John and I have hunted ducks and geese with a father and grandfather since we were kids—more than half a century—and Scott has had the same obsession since he was 12. The prospect of slogging in predawn darkness through ice-covered, boot-sucking marshes carrying a bulky sack of decoys, a shotgun, shells, Thermos and lunch makes us happy.

"Throughout all these years, Lake Mattamuskeet has been our favorite destination—or, as I think of it, comedy central."

We miss brother Graham on these hunts because he, perhaps wisely, decided some years ago that the cartoon life was not for him. We suspect this is related to the time he accidently stepped off the edge of a blind. He quickly discovered that—unlike Wile E. Coyote—you don't continue to walk in thin air until you realize that's where you are. He plunged headlong through a half inch of ice into three feet of water.

Throughout all these years, Lake Mattamuskeet has been our favorite destination—or, as I think of it, comedy central. This past season proved no different.

On the first morning of our two-day hunt, I stepped outside our room at 3:30 a.m. buck naked because the space heater had two settings—full blast and off—and was greeted by a 70-some degree drop in ambient temperature. In other words, conditions were ideal.

Shortly after 6 a.m., following the customary pre-hunt orientation at refuge headquarters, we were in our blind with our decoys set and our mechanical Mojo duck twirling his wings enticingly. For the first time ever, I had also brought a propane blind heater, which I fired up as we waited for legal shooting time. It was deliciously cozy.

Then, suddenly, the heater emitted a wheezing "poof," erupting in flames. John immediately grabbed it with his gloved hands and gave a mighty heave that launched the fiery blob in a high, seemingly slow motion end-over-end arc. It crashed through the patchy ice 30 feet in front of the blind, emitting jets of steam and flame. We sat in disbelief as the heater continued to burn for a moment or so, then began to burble ominously as the propane continued to escape, casting an eerie greenish light through the ice. We all had the same thought. Surely, hunters in nearby blinds had seen that. In the darkness, space station astronauts could have seen it. What must they think?

Propane continued to burble for another 30 minutes, but the ducks didn't care. Singles and small flocks began sailing into the decoys—perchance attracted by the glow—and we were soon shooting and collecting our kills. It was some of the fastest action any of us had ever had at Mattamuskeet, and by late morning with 30 minutes of shooting time still remaining, we were only two birds shy of our limits. To our delighted disbelief, an improbable pile of wigeon, teal, gadwalls and black ducks lay in the corner of the blind.

Then Goofy showed up again. Scott nailed a wigeon, and waded out to get it. He was headed back to the blind when another flock of wigeon circled the decoys. He crouched, dropped his retrieved "dead" duck on the water, and shot the incoming bird that would complete our limits. When he reached for his floating wigeon moments later, it was gone. We looked for it in vain. Did it revive and swim away or dive and hang onto vegetation? With a wrung neck? Only Goofy would know.

At the checkout station after the hunt still one shy of our limit—but by no means displeased—we waited for the inevitable questions about that flaming missile launch over blind 13. No one mentioned it.

But as Porky Pig might say, "The-bea, the-bea, that's not all folks." The following morning was solemnly cold and the lake was slick calm. We set out the decoys in the dark as usual and climbed back into the blind to wait. With shooting time only minutes away, a big flock of ducks, likely wigeon, circled several times then landed in the decoys. They frolicked and fed, and then they swam slowly away. They were barely visible as they finally took flight.

That's when we witnessed something none of us had ever seen. Within what seemed only minutes, the calm water began to develop a skim of ice. By legal shooting time, it had spread and thickened until it was a solid sheet as far as you could see.

A day after we had experienced the best duck hunting on Mattamuskeet we'd ever had, we didn't fire a shot. Suffering Succotash!

SCOTT HOLDING

Max Patch mountain near Hot Springs, NC

OUTDOOR MOMENT

IN THE JANUARY · FEBRUARY ISSUE

IGOR MOJZES/123 RF STOCK PHOTO

BEST IN SHOW

We present the winners of our ninth annual photo competition. See more than 30 great photographs representing 10 categories.

WINTER BUGS

In North Carolina, hardier fly-fishermen can pursue mountain trout all year. Learn about some of the insects they might be eating when "blood is nipt and ways be foul."

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